Rachel's Environment & Health News
#558 - Diabetes is Increasing
August 06, 1997

A new study confirms that Vietnam veterans have an increased likelihood of getting diabetes if they have elevated levels of dioxin in their blood.[1] Dioxin is a powerful hormone-disrupting chemical found in Agent Orange, an herbicide sprayed by American forces during the Vietnam war.

Recent studies have also indicated that diabetes is increasing among the general population in the U.S.[2] and worldwide. The increase is especially rapid among children.[3,4] At the recent 16th International Diabetes Conference in Helsinki, Finland, researchers said that diabetes is becoming a global epidemic. "I think we can truly say that the epidemic is here and now," said Paul Zimmet, chief executive officer of the International Diabetes Institute.[5]

Diabetes is a disease of the endocrine system.[6] Specifically, diabetes is a disorder of the pancreas, which is a long, thin organ (roughly 7 inches long), behind your stomach. The pancreas produces hormones that help digest your food, but the pancreas has another important function as well: it creates hormones that regulate your body's use of glucose, a form of sugar that fuels most of the daily activities of all your body's cells.

The pancreas produces three hormones: insulin, glucagon, and somatostatin. When the concentration of sugar rises in your blood (for example, after a meal), insulin stimulates muscle and fat cells to remove glucose from the blood and store it. Insulin also stimulates storage of excess glucose in the liver in the form of a starch called glycogen.

When more sugar is needed in the blood, the pancreas produces the hormone glucagon to break down glycogen in the liver and turn it back into sugar, which is then released into the blood stream. The third pancreatic hormone, somatostatin, is not so well understood as the other two but is thought to help regulate sugar levels in the blood.

When the pancreatic system fails to control glucose properly, the blood can end up containing too much sugar --a condition called hyperglycemia. Eventually the excess sugar is measurable in the urine. When a person's body is not able to use up the available glucose in the blood, the person has DIABETES MELLITUS (Greek words for 'honey that passes through').

There are two kinds of diabetes --insulin-dependent diabetes mellitus (IDDM), and non-insulin dependent diabetes mellitus (NIDDM). IDDM is also called Type I diabetes, or juvenile-onset diabetes because it usually appears during childhood. As the name implies, IDDM requires a person to take insulin, usually by daily injections. Ten percent of diabetics have IDDM.

The other kind of diabetes --NIDDM --does not require a person to take insulin injections. The person's insulin levels are about normal, but their body seems unable to make good use of insulin. They must control their blood sugar by controlling their diet. NIDDM is also called adult-onset diabetes, or Type II diabetes. It usually appears after age 40, and the people who get it are usually obese. Ninety percent of diabetics have NIDDM.

Diabetes is a serious illness. Its main effect is to cause changes in the body's small and large blood vessels. These changes, in turn, lead to other problems: coronary artery disease, heart disease, high blood pressure, stroke, deterioration of nerves and blood vessels in the extremities (sometimes requiring amputation), blindness, kidney disease, and death.

The symptoms of diabetes are vague --tiredness, thirst, and a need to urinate frequently as the body tries to flush away excess blood sugar. For this reason, many people have the disease for years without knowing it. There are 10 million known diabetics in the U.S. and perhaps 5 million more who have not been diagnosed.[6]

Vietnam veterans

The new study of Vietnam veterans looked at dioxin levels in their blood and related that to sugar and insulin levels in their blood, and to the prevalence of diabetes and the time-of-onset of diabetes.[1] The study compared 989 veterans who had participated in Operation Ranch Hand (spraying roughly 12 million gallons of Agent Orange over 10% of South Vietnam during the period 1962 to 1971) vs. a control group of 1276 Air Force veterans who served in Southeast Asia during the same period but did not participate in the herbicide spraying program. During manufacture, Agent Orange was contaminated unintentionally with dioxin at a level of about 3 parts per million (ppm).

The median dioxin level in the serum of the Ranch Hand group was 12.2 parts per trillion (ppt) and the median dioxin level in serum of the control group of veterans was 4.0 ppt. (Blood serum is the fluid remaining after cells are removed from blood.)

The researchers found that the Ranch Hand veterans were about 50% more likely to get diabetes, compared to the control group. In addition the severity of diabetes increased within the Ranch Hand group as the level of dioxin in blood increased. And lastly, the time-to-onset of diabetes was less among the Ranch Hand veterans who had more dioxin in their blood. The study found consistent increases in the likelihood of glucose (blood sugar) abnormalities with increasing dioxin.

Among the control group, the researchers noted an increasing likelihood of abnormally high levels of insulin in blood serum as dioxin levels increased.

Previous studies of industrial workers exposed to dioxin had given mixed results. Some showed increases in likelihood of diabetes with increasing dioxin,[7] while others had shown no such increases.[8] Six studies of three species of laboratory animal (rats, mice, and Guinea pigs) have shown alterations in glucose metabolism with low levels of dioxin exposure, thus increasing the biological plausibility of the idea that dioxin might cause diabetes.[9]

General population

As indicated above, IDDM is largely a disease of children. On the other hand, NIDDM, is largely a disease of adults. Now, however, NIDDM is striking more and more children. Prior to 1992, among pediatric patients with diabetes, only 2% to 3% had NIDDM. In other words, 97% to 98% had IDDM.[3] In recent years, however, there has been a dramatic increase in the number of children diagnosed with NIDDM. In a study of youngsters in Cincinnati, Ohio, in 1994, NIDDM accounted for 16% of all new diabetes cases. Among diabetes patients 10 to 19 years of age in Cincinnati, NIDDM accounted for 33% of diagnoses of diabetes in 1994. [3] This represents a 10-fold increase in NIDDM among children in recent years.

Obesity has been increasing among children in recent years as well. Between 1980 and 1990, the proportion of children defined as obese increased from 15% to 21%.[4] The Cincinnati researchers clearly see these two trends as linked.

The Cincinnati researchers asked themselves whether their results could be caused by greater general awareness of NIDDM among physicians. Or by earlier detection and referral. Or by changes in the general population of Cincinnati in recent years. They ruled out all these potential confounders and concluded that the increase in NIDDM among children is very likely a real increase.

Why are more children getting this adult disease? Many researchers have noted a relationship between obesity and diabetes in both adults and children. Indeed, in the Cincinnati study, 92% of 1027 children with diabetes were obese.

However, there is, so far, no known biological mechanism to explain how the presence of excess body fat might cause diabetes.

The finding that an endocrine-disrupting chemical like dioxin may be able to promote diabetes opens up new avenues for thought about this rapidly-increasing disease. Perhaps it isn't fat itself that causes diabetes --perhaps it is the toxic chemicals stored in our fat that cause disease. It has been known for a long time that human fat accumulates toxic chemicals. For example, the U.S. Public Health Service has been collecting samples of fat from humans for 20 years and analyzing them for halogenated hydrocarbons,[10] including dioxin, beta-hexachlorocyclohexane, heptachlor, DDT, DDD, DDE, PCBs, trichloroethylene, perchloroethylene, 2,4-D, methyl chloride, vinyl chloride, polyvinyl chloride (PVC), and chloroform, among others. We each carry literally hundreds of exotic toxic chemicals in our body fat. For any particular chemical, our fat often has a concentration 100 times as high as the concentration in our blood serum. It is also known that chemicals can be released from fat to re-circulate in the blood stream during times of pregnancy, stress, illness or fasting. Many fat- stored organohalogens are known to interfere with our endocrine systems by mimicking or blocking natural hormones.[11]

Diabetes is on the rise worldwide. "I expect diabetes to be one of the major killers of the world in the year 2010," says Jak Jervell, president of the International Diabetes Federation.[5] Worldwide, an estimated 135 million people have been diagnosed with diabetes. By 2025, the World Health Organization predicts, the number will be 300 million. "What is bothering me is that the developing world will bear the brunt of this increase," says Jervell. He was referring to people adopting an American lifestyle: fatty fast food, with little or no physical exercise. But there's another key feature of American life that we often don't advertise: from exposure to water, food, and air, we all take a bath more or less continuously in low levels of exotic, poorly-understood toxic chemicals, many of which interfere with our hormones. No doubt about it, for many people it's a wonderful life. But the price we pay in chronic disease is high and steadily rising.[12]

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

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[1] Gary L. Henriksen and others, "Serum Dioxin and Diabetes mellitus in veterans of Operation Ranch Hand," EPIDEMIOLOGY Vol. 8, No. 3 (May 1997), pgs. 252-258. Earlier studies suggesting that Vietnam Veterans have an increased likelihood of diabetes are reviewed in Institute of Medicine, VETERANS AND AGENT ORANGE: HEALTH EFFECTS OF HERBICIDES USED IN VIETNAM (Washington, D.C.: National Academy Press, 1993), pgs. 11- 12, 11-13, and 11-15 through 11-17; see also Chapter 6.

[2] J.A. Fain, "National trends in diabetes. An epidemiologic perspective," NURSING CLINICS OF NORTH AMERICA Vol. 28, No. 1 (March 1993), pgs. 1-7.

[3] Orit Pinhas-Harniel and others, "Increased incidence of non-insulin-dependent diabetes mellitus among adolescents," THE JOURNAL OF PEDIATRICS Vol. 128, No. 5, Part 1 (May 1996), pgs. 608-615. And see Associated Press, "Adult Diabetes Type on Rise in Young," NEW YORK TIMES July 8, 1997, pg. C7.

[4] Carla R. Scott and others, "Characteristics of Youth-onset Noninsulin-dependent Diabetes Mellitus and Insulin-dependent Diabetes Mellitus at Diagnosis," PEDIATRICS Vol. 100, No. 1 (July 1997), pgs. 84-91.

[5] Maggie Fox, "World suffering diabetes epidemic, conference told," Reuter World Service July 21, 1997. (Available in File 611 of the Dialog online database. Phone: 1-800-334-2564.)

[6] "Your Endocrine System," in David E. Larson, editor, MAYO CLINIC FAMILY HEALTH BOOK Second Edition (New York: William Morrow, 1996), pgs. 923-952, especially pgs. 925-936.

[7] M.H. Sweeney and others, "Prevalence of diabetes and elevated serum glucose levels in workers exposed to 2,3,7,8-tetrachlorodibenzo-P- dioxin (TCDD)," ORGANOHALOGEN COMPOUNDS Vol. 10 (1992), pgs. 225-226.

[8] Andreas Zober and others, "Morbidity follow up study of BASF employees exposed to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) after a 1953 chemical reactor incident," OCCUPATIONAL AND ENVIRONMENTAL MEDICINE Vol. 51, No. 7 (July 1994), pgs. 479-486. But see also M.G. Ott and others, "Laboratory results for selected target organs in 138 individuals occupationally exposed to TCDD," CHEMOSPHERE Vol. 29 (1994), pgs. 9-11.

[9] The animal studies are listed in notes 16-21 of reference [1].

[10] Lenore Kohlmeier and Martin Kohlmeier, "Adipose Tissue as a Medium for Epidemiologic Exposure Assessment," ENVIRONMENTAL HEALTH PERSPECTIVES SUPPLEMENTS Vol. 103, Supplement 3 (April 1995), pgs. 99-106.

[11] See, for example, Robert M. Bigsby and others, "Xenobiotics Released from Fat during Fasting Produce Estrogenic Effects in Ovariectomized Mice," CANCER RESEARCH Vol. 57, No. 5 (March 1, 1997), pgs. 865-869.

[12] See REHW #536.

COME BEAR WITNESS TO INJUSTICE

Next Thursday, August 14 at 4:30 p.m. a silent vigil will help us all bear witness to the huge injustice represented by the WTI incinerator in East Liverpool, Ohio. (See REHW #255, #287, #288, #298, #315, #320, #325, #326, #328, #341, #542.)

At 6:30 that evening, the U.S. EPA will once again hold a public hearing to explain to the citizens of East Liverpool why their children must attend an elementary school 1100 feet from the stack of the largest hazardous waste incinerator in America.

On May 8 EPA released its 3800-page risk assessment on the WTI incinerator and sent one copy to one citizen in East Liverpool. On May 9 EPA held a public hearing in East Liverpool to take testimony on the risk assessment that no one had seen, much less read. Peer reviewers were given 10 days to review the 3800 pages and send their comments to EPA. One day after the deadline for peer review comments -- May 20th -- EPA issued the full commercial operating permit to the WTI incinerator.

Words cannot express the outrage and disgust that we feel. Has there ever been a government agency more arrogant or more cynical than William Jefferson Clinton's (and Carol Browner's) EPA? Come bear silent witness with us. At the East End Elementary School in East Liverpool, Ohio at 4:30 pm. (Don't know where it is? Come to town and ask.) And at the EPA public hearing in City Hall at 6:30. Be there if you can. This is one of the most important citizen fights of this century. We must never concede victory to the forces of evil -- the Von Roll Corporation and its corrupt acolytes in Washington. --Peter Montague

Descriptor terms: vietnam vets; agent orange; dioxin; diabetes mellitus; pancreas; hormone disruptors; insulin; glucagon; glycogen; hyperglycemia; iddm; niddm; ranch hand; operation ranch hand; cincinnati; disease statistics; mortality; morbidity; obesity;

somatostatin; wti;

Rachel's Environment & Health News is a publication of the Environmental Research Foundation, P.O. Box 160, New Brunswick, NJ 08903-0160; Phone: (732) 828-9995; Fax (732) 791-4603; E-mail: erf@rachel.org; http://www.rachel.org. Unless otherwise indicated, Rachel's is written by Peter Montague.