

## HEALTH AND THE ENVIRONMENT

# The New War on Cancer: Against All Causes

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For more than 50 years, the cigarette industry claimed that smoking did not cause lung cancer, and we wasted a half-century debating this point. The industry obfuscated the issue with "scientific experts," statisticians, and lawyers. It was not until the mid-1990s that a published paper demonstrated irrefutably how benzopyrene, a dioxin chemical in cigarette smoke, knocked out a tumor suppressor gene called P 53. This was the smoking gun, and cigarette company executives could no longer deny smoking caused lung cancer.

Today, one in three Americans will hear the words, "You have cancer." In addition, more than one in four will die of the disease.<sup>1</sup> True, more Americans are surviving cancer—some 9.8 million Americans in 2001, versus 3 million who were living with cancer in the early 1970s when the war on cancer was first announced by President Nixon.<sup>2</sup> Much of this "war" however, has focused only on treating the disease rather than studying the causes and preventing cases from arising. But another statistic is also true: Cancer rates are increasing in almost every category.

In 2003, cancer cases in this country were expected to increase 3.8%, to a record 1.33 million cases.<sup>3</sup> Non-Hodgkin's lymphoma rates have tripled since the 1950s, and some children's cancers have increased 30% in the last 30 years alone. American women are suffering increases for two major kinds of cancer. Throughout 1998, more women than men were getting lung cancer, and today 1 in 7 women in American has a lifetime risk for breast cancer. In the 1940s, that risk was 1 in 22. We know that the rate of cancers not associated with smoking are higher for people born *after* 1940 than for those born before. In addition, we know that genetic mutations occur in, at most, 10% of breast cases.

Protestations to the side, it looks like most cancers do not result from genes. In 2000, *The New England Journal of Medicine* published the largest study to date among twins. Identical twins share identical genes, and researchers found that these twins developed the same disease only about 10% of the time. They developed breast, colon, and prostate cancer about 14-30% of the time, a clear indication that something other than heredity is driving cancer rates.<sup>4,5</sup>

We know that some women with inherited mutations of the tumor suppressor genes BRCA1 and BRCA2 do have an 82% higher lifetime risk for breast cancer. But recent research has determined that such risk has increased since 1940. For mutation carriers, the risk was 24% if they were born before 1940, but 67% if they were born after 1940. In the same study, lifetime risks of ovarian cancer also more than doubled among the mutation carriers.<sup>6</sup> Something else is contributing to these risks, and based on much that we've learned in the last 10 years about the adverse interactions between chemicals and genetic makeup, environmental toxins are the most likely culprit. I don't think it is "coincidental" that the doubling of the risk for BRCA women has occurred since World War II.

Prevention, by far, is the best course of action, and the time for action is now. In today's world, every single person is vulnerable, but especially children, whose body systems change on a regular basis. Their size alone ups the level of impact from exposures because they drink, breathe, and eat far more than an adult, pound for pound. Yet, government standards for the "safe" levels of exposures are based on the size of an adult male. For the widely used indoor pesticide chlorophrofos, exposures for children were up to four times higher than proposed federal guidelines.<sup>7,8</sup>

In the cases of infants and fetuses, exposures can be even more catastrophic. A woman's lifetime accumulation of toxins can be partially passed on to the fetus *in utero* or to the infant through breast milk, and the concentration can be 10 to 40 times greater than what an adult is exposed to on a daily basis. Workers can sometimes be at higher risk for disease due to exposures in the workplace. Organic solvents (widely used in glues, paints, adhesives, coatings and the production of plastics, agricultural products and pharmaceuticals) can be very neurotoxic, affecting the central nervous and respiratory systems. In the early 1970s, the National Institute for Occupational Safety and Health (NIOSH) estimated that approximately 9.8 million workers were exposed to organic solvents.

According to the World Health Organization, an estimated 49 million tons of industrial solvents were produced in the United States in 1984 alone. There is extensive data on the harm to human health of many of these products such as asbestos,<sup>9</sup> benzene,<sup>10</sup> and vinyl chloride,<sup>11</sup> which I discuss in my new book *Nurture Nature/Nurture Health*.

Even the news on passive smoking has recently worsened. Last summer, its dangers were reported to be twice as bad as previous assessments. A study published in the *British Medical Journal* online found that nonsmokers exposed to smoke from other people (referred to as ETS, or environmental tobacco smoke) had a 50-60% increased risk of heart disease compared to those who lived and worked in a smoke-free environment. Previous assessments had put the increased risk at only 25-30%.<sup>12</sup> This is made more outrageous in light of the well-documented suppression by the tobacco industry of evidence of the harm caused by smoking.<sup>13</sup>

Exposures for children are particularly frightening. Children in California who live in areas with higher levels of hazardous air pollutants (HAPs) have higher rates of leukemia. Their risk of AML (acute myeloblastic leukemia) was 46% higher at the highest exposure level.<sup>14</sup>

The most recent assessment of environmental chemicals—the largest to date from the CDC (Centers for Disease and Control)—confirmed the prevalence of exposures. Researchers found that among the 166 chemicals analyzed, levels for chlorpyrifos (an extremely toxic organophosphate pesticide) in children were about twice as high as those found in adults! Pesticides have been shown to contribute to learning disabilities and other serious, sometimes deadly, disorders in children.

Humans also carry what is called a "body burden" of synthetic chemicals in their bodies. These chemicals store in the body for decades and can be found in our blood, fat, mother's milk, breath, semen, and urine. The body cannot efficiently metabolize or excrete them; therefore, they accumulate. These chemicals can be found throughout the world—in drinking water, air and food supply, and in remote places as far away as the Antarctic. Random testing has shown that an average American can be walking around with 70, 80, or more of these chemicals in their bodies.

Remember, children are naturally free of toxins. They don't drink alcohol, smoke, or have exposures in the workplace.

If you are evaluating whether a chemical is too dangerous for your child, it is imperative to remember that a very small amount of chemical can do enormous harm. Exposure standards (and consequently labeling) are set for an adult male body. The rule of thumb: far less exposure, or no exposure at all.

Recent CDC statistics show that cancer is the second largest cause of death for children, ages 5 to 14, after accidents. This may be startling, but we only have to look at the dramatic increases in childhood cancers in recent decades to understand that something has changed to severely diminish this generation's welfare, compared to children who grew up before World War II. Since the early 1970s, childhood non-Hodgkin's lymphoma has increased 30% and acute lymphoblastic leukemia has increased 21%. One study showed that children who

are exposed to pesticides in the home have a 3 to 7 times greater risk of developing non-Hodgkin's lymphoma.<sup>15</sup>

Most of us have no idea of the amount of chemicals we are carrying around in our bodies, or that they are even there. Referred to as the "toxic load," such residues can be detected in samples of blood, urine, and breast milk. For his 2001 PBS documentary about chemicals called "Trade Secrets," host Bill Moyers was tested and 84 distinct chemicals were found in his body.<sup>16</sup> Moyers highlighted pollutant loads in the human body that were being studied at New York's Mount Sinai School of Medicine. In a recent survey of 139 streams in 30 states, researchers uncovered 95 organic compounds in 80% of the streams—everything from household chemicals to drugs and antibiotics. Is it then any wonder that rates of non-Hodgkin's lymphoma, brain, liver, testicular, kidney, and bone marrow cancers have increased significantly since 1950.<sup>17</sup> While improved screening explains some of these increases, this cannot begin to explain their extent.<sup>18,19</sup>

By the EPA's own account, four of the top six toxins are metals: mercury, lead, cadmium and arsenic.<sup>20</sup> Because our own bodies use metals, these toxic metals can interact with the human body in ways similar to POPs (persistent organic pollutants). They are referred to as xenobiotics.<sup>20</sup>

Most importantly, they can be lethal at any dose. The fundamental rule of toxicology is that the dose makes the poison. In the case of these four metals, they persist not only in the environment but in our own bodies. Metals like lead, arsenic, cadmium, and mercury concentrate in organs such as the kidneys and liver, brain, skeleton, and our hair and nails. We know from massive research that these metals have been associated with diseases like cancer, Alzheimer's, Parkinson's, low birth weights, osteoporosis, hypertension, and lowered IQs in children.

Hormone-disrupting chemicals are very troublesome because they persist for years, even decades, in the environment as well as in our own bodies. They include common chemicals such as DDT, arsenic, dioxin, lead, mercury, chlordane, dieldrin, cadmium, PCBs, and bisphenol A (a component in polycarbonate plastic). DDT, although banned in this country in 1972, is a prime example of this class of chemicals whose damaging effects can reach into future generations. They can last for many, many years because of their decades-long, half-life in the body and their persistence in the soil. (Half-life refers to the time it takes for one-half of the original amount of a pesticide to be completely degraded.)

Hormones are naturally occurring chemicals in the body that circulate at very low levels in the blood. Because hormone-disrupting chemicals are constituted like natural hormones, they disrupt natural messages by hormones in the body, resulting in scrambled messages within the body's endocrine and reproductive systems in particular. This means that women who have been adversely exposed to such chemicals have a higher likelihood of breast cancer or of giving birth prematurely or of having infants who might have low birth weights, deformities, or reduced mental capacity. A study published in 2001 by the Centers for Disease Control reviewed data that had been collected since the 1960s. Researchers ascertained that there had been an epidemic of preterm births during the years when DDT was most used in this country and that DDT exposure may have accounted for up to 15% of infant mortality during this period.<sup>21</sup>

Growing research suggests that PCBs, in fact, cause cancer. A study of workers in an Italian capacitor manufacturing plant noted that the increase of deaths to males from gastrointestinal tract cancers was almost three times higher and for exposed women, all causes of death were significantly higher, especially those from leukemia.<sup>22</sup> Another study measured organochlorine compounds in patients who had died of cancer and in patients who died of other diseases. The mean levels of PCBs in fat levels in 11 male cancer patients was significantly higher (8.8 mg/kg) than in noncancer patients (5.9 mg/kg).<sup>23</sup>

Lake Ontario, has the highest levels of furans and dioxin of all of the Great Lakes. A major source is a very large cement plant on the western shore of Lake Ontario that began burning

waste in 1956. Furans and dioxins are biproducts of this kind of waste incineration. A University of Wisconsin study showed that trout have been dying off in this lake since the 1950s.<sup>24</sup> Not only that, but every time government agencies try to reintroduce trout into the lake, the trout die because the furans and dioxin have such a long half-life. Other native animals are affected. Both snapping turtle eggs and seagull eggs around Lake Ontario have the highest amounts of these chemicals compared to any of the other Great Lakes.<sup>25</sup> Humans are also adversely affected when eating contaminated fish. A study of Mohawk mothers in upstate New York revealed that, when these women reduced the amount of PCB-contaminated fish they ate, PCB levels in their breast milk were lowered.<sup>26</sup> This is made even more alarming by the 2005 EPA findings of both increased cancer rates in humans and reproductive impairment in animals secondary to PCB exposure.

For women, exposure to hormone-disrupting chemicals is a very real risk for breast cancer. German women were examined for the presence of PCBs, DDT, DDE, and hexachlorocyclohexane. Researchers found higher concentrations of all of these chemicals in tissue from women with breast cancer than in tissue from control subjects. Breast cancer was diagnosed in 45 of the 65 women.<sup>27</sup>

The Long Island Breast Cancer Study was sponsored by the National Cancer Institute in collaboration with the National Institute of Environmental Health Sciences to analyze the possible role of organochlorine pesticides and PCBs in breast cancer development in three high-risk counties in Long Island, New York, and one county in Connecticut. The report, which did not find "convincing evidence of an association," was published in 2000.<sup>28</sup>

It is important to remember that this study only measured pesticides in women with and without breast cancer in single serum levels. For more realistic data, tissue levels need to be looked at because these levels can be up to 350 times higher than in the serum. It often takes decades for cancer to develop, and a single serum level cannot reveal what might have happened years before when the exposure was occurring. What we also know is that the breast cancer rates are higher in parts of Long Island, according to the New York State Department of Health.

Women are particularly vulnerable to the storage of toxins because of something called bioaccumulation. This refers to the body's storage of a compound at a rate faster than the body can metabolize or excrete it. Many of these synthetic chemicals are soluble in fat, and so they become stored in body fat such as breasts, the liver, bone marrow, and the brain. Women's body fat is proportionately 2-10% higher than that of men, so when they are exposed to the same amount of chemicals, they store more of these toxic, fat-soluble materials.

Environmental toxins affect all living things. We can observe the devastation of pollution on plant life, coral reefs, or our water supply. We can see how global warming changes the climate, resulting in drought that takes millions of lives. Common chemicals that we are exposed to everyday, particularly in our most advanced, first-world cultures—pesticides, herbicides, dry cleaning chemicals, car exhaust—also take their toll on humans, in the form of numerous diseases, some of them deadly. Throughout the food chain, a spilled toxin thousands of miles away can leech into the soil, poison a plant eaten by an animal that winds up in the meat we eat here at home or in the breast milk a mother feeds to her infant. Environmental toxins are never safe, no matter how "removed" we may choose to think we are from them.

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