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# Potential Environmental Contributors to Developmental Disabilities: Why We Should Care

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**ELISE MILLER, M.ED.**  
**EXECUTIVE DIRECTOR**  
**INSTITUTE FOR CHILDREN'S ENVIRONMENTAL HEALTH**  
**FREELAND, WA**

## What is Environmental Health?

For the purposes of this paper, environmental health refers to any health impact environmental exposures may have on adults and children, starting as early as fetal development. These environmental exposures can come through our air, water, and food. For example, toxic exposures may emanate from industrial or medical waste incinerators, chemical fertilizers on our lawns, insecticides in our homes, lead-based paint on our walls, and endocrine-disrupting chemicals and carcinogens in our personal care products. We can also be exposed to various toxics found in building materials in our homes, schools, hospitals, and offices as well as in breast milk itself. Recent studies suggest that the health impacts of these exposures may include asthma, birth defects, hypospadias, behavioral disorders, learning and developmental disabilities, various cancers, impaired immune and neurological systems, and reproductive disorders.

Environmental health is also inextricably linked to many other social, environmental, and economic factors. Disparities in exposure to hazardous air pollutants, and contaminated drinking water and soil are associated with race and/or economic class because minorities and low income families often live closer to industrial sites or more polluted areas where land and housing costs are lower.

In addition, since the health of humans is inextricably connected to the overall health of our ecological systems—including the health of all other species and the health of forests, prairies, wetlands, rivers, lakes, and oceans—environmental health is ultimately about the health of our planet.

## Why Is This More of a Problem Now?

Since the petrochemical industry started around World War II, about 80,000 new synthetic chemicals have been approved for use. Of the 15,000 mostly commonly found chemicals, the vast majority have not been tested individually for human health impacts, and none of them have been tested in combination. Each year about 1,500 new chemicals

are introduced. Because some of these chemicals bioaccumulate in fatty tissue, they may be found in higher quantities in dairy and meat products. Many of these chemicals migrate easily through the air and water and through the globalized consumer market. For example, chemicals such as DDT, which was banned in the U.S. years ago, still persist in our environment and in our bodies here in the U.S. and continue to reach us through foods we may import from developing countries where these pesticides are still used.

Some of these synthetic chemicals are also passed on from pregnant mother to fetus and through breast milk to nursing infant. Recent research studies suggest that exposures to specific chemicals at certain doses during particular developmental windows in fetuses and young children may contribute to a range of health concerns. Some of these health concerns may show up immediately, and others may not become evident until later in life. This is believed to be the case with some reproductive disorders and cancers.

For these reasons, no one is immune from these toxic exposures. Industrialized and non-industrialized populations, adults and children, wealthy and poor, we are all subject to exposures in the air, water, and food supplies. The Centers for Disease Control (CDC) released two reports over the last couple years demonstrating that we all carry chemicals, potentially hundreds of chemicals, in our bodies that did not exist 60 to 70 years ago. We are only being to understand the implications for long-term health.

## Why Are Children Particularly Susceptible?

Children eat, breathe, and drink far more than adults in proportion to their body weight. For example, they drink seven times more water and take in twice as much air than adults on average. They also ingest half of their lifetime pesticide intake, mostly through food, by the age of five. In addition, children behave differently from adults. They spend more time on the ground—on carpets, lawns, and floors that may have been treated with pesticides or other synthetic chemicals. Plus, they have many more hand-to-mouth transfers and touch objects and surfaces more frequently without washing their hands, thereby increasing their exposures. In addition, many of their biological systems—endocrine, neurological, hormonal and immune—are still developing well into their teenage years, and exposures to some of these chemicals at certain developmental windows can compromise those systems for a lifetime.

## Do Adults Need to Be Concerned About Exposures as Well?

Chemicals exposures may not impact adults in the same way as children, but adults' health can also be compromised by environmental toxicants. Even adults without any other health issues may respond negatively to certain exposures, and those with existing conditions may find their health problems are exacerbated. For example, some scientists, such as Bernard Weiss, Ph.D., at the University of Rochester, have suggested that if even small amounts of neurotoxicants such as lead and pesticides get into the systems of those with neurological disabilities, these chemicals could have significant health impacts.

Some of these impacts may include the capacity to learn, talk, read, calculate, memorize, conceptualize, organize, pay attention, interact socially, and/or behave appropriately.

Exposures may also induce certain health conditions that otherwise may not have occurred. A few years ago an environmental health researcher offered a helpful analogy: “genes load the gun, and the environment pulls the trigger.” In other words, a person may have a genetic propensity for a health condition like asthma, but it is not until they are exposed to particular toxicants that their asthma is actually triggered.

In addition, women of child-bearing years need to be particularly conscious about what they take into their bodies because these chemicals may be passed on to their children in utero and through breastfeeding. Research to date suggests that in utero exposures are likely to be more highly associated with harm, particularly if they occur at specific developmental windows. However, even though scientists have found that a mother releases some of her toxic “body burden” by breastfeeding, breastfeeding is still superior to formula feeding for a variety of reasons. (For more in-depth information, see “Having Faith: An Ecologist’s Journey to Motherhood” by Sandra Steingraber, Ph.D.)

## Why Should We Care About These Toxicants in Relation to Developmental Disabilities?

Given how complex our biological systems are and the fact that brain development is influenced by heredity, genetic, social, and environmental factors and the interactions among them, we do not know yet exactly how these toxics may be implicated in the manifestation of mental retardation and other developmental disabilities as opposed to attention deficit or various learning disabilities. In addition, research in this area is still quite nascent, so inevitably some of the findings have conflicting results that will need to be clarified through further studies.

That said, definitive research shows environmental factors such as lead, mercury, polychlorinated biphenyls (PCBs), alcohol, toluene, and tobacco smoke are capable of disrupting human brain development. This disruption, in turn, can result in permanent, negative impacts on intelligence, learning, attention, memory, comprehension, language acquisition, written and verbal communications, behavior, and socialization—some of which are considered attributes of developmental disabilities. Additional environmental chemicals and pollutants, such as some pesticides, solvents, and other heavy metals have been shown to disrupt brain development in animal studies and are suspected of having similar effects in humans.

### Statistics

In this context, please consider a few statistics:

- Incidence of childhood brain and nervous system cancers jumped 1.8 percent per year, or 40 percent from 1973 to 1994 (Gurney, Smith, Bunin, “Cancer Incidence and Survival Among Children and Adolescents,” National Cancer Institute, 1999).

- Autism spectrum disorder is estimated to affect 450,000 children under the age of 18 and it appears to be 10 times more prevalent today than it was in the 1980s (*Journal of the American Medical Association, January 2003*).
- An estimated 12 million children (17 percent) in the U.S. suffer from one or more learning, developmental, or behavioral disability, and that number appears to be increasing (Boyle, Decouffle, Yeargin-Allsopp, *Journal of Pediatrics*, 93(3):399-403, 1994).
- Mental retardation now affects 2 percent, or approximately 1.4 million children under the age of 18 (American Association on Mental Retardation, June 2002).

Given that these increases are relatively recent, and more chemicals that can impact brain development are being manufactured and put in the marketplace each year, environmental exposures are likely a significant reason we are seeing the numbers of neurological problems we are today. That is why we need to increase research in this area. We also need to learn more about how neurotoxicants may contribute to mental retardation relative to various learning disabilities or autism.

In the meanwhile, the apparent increases in the incidence of learning and developmental disabilities are already being played out in real world terms. Any kind of neurological disability can have serious adverse consequences for affected children and adults, their families and communities. These can include psychological and economic costs associated with unemployment, school dropout, teen parenting, substance abuse, welfare dependency, and involvement with juvenile and adult criminal justice systems. This means major economic costs for the families and for society at large.

### Economic Impact

Providing special education services to students with disabilities amounted to \$77.3 billion, or an average of \$12,474 per student in 1999-2000, which is almost 22 percent of the 1999-2000 total spending on all elementary and secondary educational services in the U.S. The total expenditure per regular education student is only \$6,556. (1999-2000 U.S. Department of Education, American Institutes for Research, March 2002).

Economic costs for society of neurodevelopmental deficits amount to \$81.5 billion to \$167 billion per year (*Environmental Health Perspectives 109 (supplement 6):885-903 (2001)*).

### Crime

In addition, researchers and advocates point to studies that find higher percentages of children with disabilities end up in the juvenile justice system. In a report, "Addressing the Needs of Youth with Disabilities in the Juvenile Justice System: The Status of Evidence-Based Research," released by the Washington, D.C.-based Urban Institute in May 2003, the co-authors found that children and youth with disabilities have become increasingly overrepresented in the juvenile justice system. Earlier in the year, Dr. Herbert Needleman (who did groundbreaking studies on the effects of lead exposure on children that were instrumental in establishing nationwide government bans on lead from

paint and gasoline) released a study in the January 2003 issue of the *Journal of Neurotoxicology and Teratology*. His research revealed that children who were exposed to lead, a known neurotoxicant, had a higher likelihood of developing delinquent behavior and going into the juvenile justice system. If exposures to neurotoxicants can result in disabilities that, in turn, lead to delinquency, then eliminating these environmental exposures has the potential of not only decreasing the numbers of those with disabilities, but the burden on the juvenile justice system.

### Educational Impact

Studies have also indicated that in school classrooms poor indoor air quality makes it far harder for children to learn because the toxics in the air can make it more difficult to think clearly and concentrate. This is well-documented in the cover story of the June 2002 issue of the National Institute for Environmental Health Science's *Environmental Health Perspectives*, "Learning the Hard Way: the Poor Environment of America's Schools." Common sense suggests that if a student already has a developmental disability, these unhealthy exposures are only going exacerbate his or her challenges learning in school.

In short, we should care about potential environmental contributors to developmental disabilities for two main reasons: 1) because research is increasingly indicating that known and suspected neurotoxicants may influence brain development in ways that can lead to disabilities; and 2) because preventing any kind of neurologically-based disability needs to be a priority if we are to have a healthy society in general.

### How Are These Concerns Currently Being Addressed?

Forty years ago, the renowned scientist Rachel Carson warned about the problematic health effects of toxic chemical exposures in her groundbreaking book, *Silent Spring*. Her views, however, were mostly met with criticism and controversy. Until relatively recently, politicians, researchers, health care professionals, and even some advocacy groups were slow to make the connection between health and the environment.

However, with the National Academy of Science's publication of [Pesticides in the Diets of Children and Infants](#) in 1993, along with other emerging research, many sectors of society have become increasingly aware of the relationship between environmental exposures and the significant rise in childhood cancers, weakened immune systems, asthma, learning and developmental disabilities, birth defects, behavioral disorders, and other health concerns. In fact, a number of organizations and institutions in the governmental, academic, and nonprofit sectors are now focusing solely on these concerns.

Some are working on legislation and regulatory policies that take into account children's unique vulnerabilities. Others are undertaking scientific research to deepen our understanding of what health impacts different chemicals may have. Still others are working on consumer issues or a range of grassroots initiatives, such as eliminating

dioxin and mercury in our medical waste stream and mitigating disproportionate pollution exposures in low income and minority neighborhoods. Some are working with industry to ensure greater corporate accountability for the possible health impacts of their products and support for the production of less-toxic alternatives. Others are helping to educate pediatricians and health care workers, while still others are partnering with parents, teachers, youth, health-affected groups, and religious communities.

Though clearly not all these efforts are directly related to developmental disabilities, the work of this diverse range of dedicated groups and individuals is beginning to form a new movement—an environmental health movement—to protect all of us from environmental contributors to health problems. According to Michael Lerner, president of Commonweal, a health and environmental research institute, this may be one of the major movements of this century—one that integrates the core concerns of human rights and civil rights groups, environmental justice organizations, the women’s rights movement, children’s advocacy groups, religious and spiritual communities, the labor movement, social development constituencies, medical and public health constituencies, the mind-body health movements, and progressive corporate interests. This burgeoning movement is motivated by the health of current and future generations and the planet.

## What Can We Do Right Now?

On personal and institutional levels, we can join this movement to protect ourselves, our families, and our communities from toxic exposures. We don’t have to wait for more scientific evidence to become available. Instead, we can start now by avoiding products treated with or containing known or suspected toxicants, and choosing safer alternatives. We can also voice our concerns to policymakers. Some specific steps we can take include:

1. Reducing exposures by washing fresh foods and eliminating excessive animal fats as much as possible from our diets since so many of these chemicals bioaccumulate up the food chain in fat tissue.
2. Reducing and eliminating “fast” or processed foods from institutional meal programs (such as school lunches) and using whole foods instead.
3. Demanding our “right to know” what chemicals are in our environment and in the products we use, and the risks they may pose to current and future generations—not only in the marketplace but in public institutions, such as schools, day care centers and hospitals.
4. Educating policymakers at local, state, and national levels to ensure that policies, legislation, and regulations are implemented that eliminate toxic exposures everywhere we live, work, study and play.

## The Precautionary Principle

In essence, this is about implementing the precautionary principle. The precautionary principle indicates that when there is plausible scientific evidence of significant harm from a proposed or ongoing activity, precautionary action should be taken to reduce or eliminate harm. These actions can include using the safest alternatives and ensuring that the proponent of an activity, such as a manufacturer of a chemical, bears the burden of assessing its safety and of showing that it is both necessary and the least harmful alternative.

We have a fundamental right to live and to raise children in a world free from chemical trespass—a world that does not threaten our health or future generations simply because we eat, breathe, and drink water in the normal course of our daily lives. And we each have an opportunity and a responsibility to ensure that right is not violated. In this context, by identifying and eliminating toxics that may impair healthy neurological development and function, we are actually working to create a healthier world for all.