Table of Contents

I. Executive Summary: Major Findings

Reported Emissions. U.S. companies reported to the Environmental Protection Agency that in 1998—the most recent year for which information is available — they released 1.2 billion pounds of chemicals into the nation's air and water that have the potential to affect the way a child's body and brain develops. More than half (53%) of all toxic chemical emissions reported to the federal Toxics Release Inventory are known or suspected developmental or neurological toxins.

Estimated Total Emissions. Emissions reported to the federal government account for only an estimated 5% of all chemical releases in the country. Using this estimate and assuming that—like for reported chemicals—approximately half of all emissions are known or suspected developmental or neurological toxins, total estimated releases of these substances to air and water could be as high as 24 billion pounds annually.

States with Highest Emissions. Louisiana and Texas lead the nation as the number one and two emitters of developmental and neurological toxins.

Largest Emitter. The chemical manufacturing industry is the single largest industrial source of developmental and neurological toxin emissions (to air and water) in the U.S. Paper, metal, and plastics manufacturers as well as electric power companies are also major emitters of these substances.

One Industry of Concern. The printing industry is the largest source of air emissions of toluene, a highly released developmental and neurological toxin. Since many printing facilities are small- to medium-sized firms, which are often closer to residential areas than other industrial facilities, this industry is potentially of major concern to child health.

Disproportionate Impacts on African Americans. Looking at the top 25 counties in the U.S. for releases of developmental toxins—where more than 46% of all reported developmental toxins were released—African American populations in 14 of 25 of the top releasing counties exceed the U.S. average. In other words, African Americans are over-represented in many of the counties most polluted by developmental toxins.

Increased Developmental and Neurological Effects. A growing number of scientists

II. Introduction

The following report is the first ever to document the exact scope, nature, and sources of chemical pollution in the U.S. that is of specific concern for child development, learning, and behavior. Using industry data reported annually to the federal government, this report estimates total likely emissions of developmental and neurological toxins in the U.S., identifies geographical hotspots for reported emissions, and identifies the most polluting industries.

Understanding this kind of toxic pollution is important because an increasing number of scientists believe that developmental and neurological toxins are partly responsible for a range of physical and mental deficits in children. Such deficits include structural birth defects, mental retardation, autism, attention deficit hyperactivity disorder, and adverse birth outcomes such as low birthweight and prematurity.

In June 2000, a scientific panel convened by the National Academy of Sciences concluded that as to lead can interfere with children's learning or how pregnant women's exposure to mercury in fish could effect the neurological development of their baby. But most people would be surprised to learn that there are 278 other substances in the environment that have the potential to affect the way a child's brain and nervous system develop (neurotoxins), or that there are 45 other substances in the environment that have the potential to affect the way a child's body develops (developmental toxins).

The public, the government, and even scientific researchers have historically given neurotoxins and developmental toxins short shrift. The reason is simple: The public's longstanding and understandable concern with cancer and chemical carcinogens has commanded the attention of the media, government officials, and scientists.

It's perhaps not surprising that the vast majority of regulatory standards for allowable exposure to toxic substances consider only the risk of cancer. Even as our knowledge of these issues improves, regulations still ignore the greater vulnerability of developing children and fetuses to toxic exposures. New chemicals introduced into commerce still do not have to be shown safe for children's developing bodies and brains.

Ignorance Prevails

The U.S. Environmental Protection Agency (EPA) estimates that up to 28% of all chemicals in commerce could have the potential to be neurologically toxic.[2] Nevertheless, current information about exposure and potential harm is sharply limited for the overwhelming majority of neurological—and developmental—toxins emitted into the environment:

- Nearly 78% of the 3,000 most highly produced chemicals have no screening information available on developmental or neurological effects on children.[3]
- Tests for developmental neurotoxicity have been submitted to EPA for only 12 chemicals—nine pesticides and three solvents—as of December 1998.[4]
- Testing for developmental neurotoxicity is not routinely required in the registration of pesticides, one of the strictest areas of chemical regulation.

Some Current Environmental Exposures Already Deemed Dangerous

There is far too little toxicity and exposure information for the vast majority of developmental and neurological toxins to allow for determinations as to whether children or pregnant women are too

- Prenatal exposure to PCBs at current environmental levels has the potential to affect brain development and cause permanent deficits.[6]

Currently, releases of 45 known or suspected developmental toxins and 278 known or suspected neurotoxins must be reported each year to the TRI *(see Appendix B)*.

Developmental toxins are those substances that can produce detrimental effects during fetal development. These effects include structural abnormalities, functional abnormalities, growth retardation, or death of the fetus. The known or suspected developmental toxins included in this report were identified as such by the California Environmental Protection Agency, which is required by law to identify safe levels of exposure to this class of substances.[8]

Neurotoxins can cause adverse effects on the nervous system. The known or suspected neurotoxins included here were identified by Environmental Defense in its Scorecard analysis, which provides the only comprehensive listing of neurotoxins available.[9] The references used to compile the list of neurotoxins appear in Appendix C.

Substances have been added to these lists most typically based on observed effects in animals or information from incidental human exposure. Some substances have been included here for which the only information available about health effects concerns studies looking at high exposure levels. Unfortunately, low level exposure studies haven't been done for the overwhelming majority of the substances identified. Additionally almost none of the substances has been tested for their effects on the developing brain and nervous system of fetuses. In the a1(d0.0d/1 e7s.)-22(A)c4elnformation f,TJT*-0.0004 Tc0.0228 Tw[(attr)11.7(es s r)noelo0.2(fos ssum

required to be reported to the TRI by some facilities. For this reason, the data analyzed in this report represent just the tip of a much larger iceberg. It is likely that additional thousands of substances in commerce and emitted into the environment have the potential to cause developmental or neurological effects in children.

Even for those chemicals reported to the TRI, it is impossible to know whether reported emissions have gone up or down. Facilities reporting their emissions since 1987 have seen a reduction of emissions of some chemicals into the environment—typically in response to public reporting requirements. But thousands of new facilities were first required to report their toxic emissions only in 1998, and the number of chemicals facilities were required to report roughly doubled in 1995. There is simply not enough information available to know whether those facilities that started reporting their emissions only last year have reduced their emissions over time.

The emissions of a limited number of developmental and neurological toxins from a limited number of reporting facilities have gone down since 1987. Nevertheless, this cannot be taken to mean that total emissions of these substances into the environment have gone down. Most developmental and neurological toxins are not reported and so industry is under no incentive to reduce their emissions. Furthermore, sharply increased chemical sales as well as economic growth over the last several years would suggest that total emissions of all toxic substances—including developmental and neurological toxins—have probably increased.

water. These are chemicals that have the potential to affect the way a fetus or a child's body and brain develops, substances that could cause premature and low birthweight births, birth defects, and learning and behavioral disabilities. More than half (53%) of all toxic chemical releases reported to the federal Toxics Release Inventory are known or suspected developmental toxins or neurotoxins.

Because fewer than 1% of chemicals in commerce require reporting of their emissions, the emissions reported to the government account for only an estimated 5% (by weight) of all chemical releases in the country.[14] Using this estimate and assuming that—like for reported chemicals—approximately half of all emissions are developmental or neurological toxins, total estimated releases of these substances to air and water could be as high as 24 billion pounds released annually.

The What, Where, Who, and Why of Developmental and Neurological Toxin Emissions

What

A total of 2.3 billion pounds of toxic air emissions and surface water discharges were reported by industry to the federal Toxics Release Inventory in 1998. Developmental and neurological toxins represent more than 53% of that total—or 1.2 billion pounds.

Table 1: Total Air and Water Releases of Developmental and Neurological Toxins, 1998

Chemical Category	Air Emissions and Surface Water Discharge (pounds)	Percent of All Chemical Releases to Air and Water*
Developmental Toxins	153,210,097	6.7
Neurotoxins	1,207,895,893	53.0
Chemicals That Are Developmental and Neurotoxins	153,138,267	6.7
TOTAL**	**1,207,967,723**	**53.00**

* 2,280,423,502 pounds of TRI chemicals were released to air and water in 1998

** Note that since some chemicals are both developmental and neurotoxins, the total has been adjusted to avoid double counting.

Source: U.S. EPA's Toxics Release Inventory, 1998

Of the top 20 chemicals reported by the Toxics Release Inventory as released into the environment in the largest quantities in 1998, nearly three-quarters are known or suspected developmental toxins or neurotoxins. The overwhelming majority of chemicals in use has never been tested for specific effects on the physical and brain development of children.

Table 2: Top 20 Chemicals Released to the Air and Water, 1998

Rank	Chemical Name	Air Emissions and Surface Water Discharges (pounds)	Neurotoxins (N) or Developmental Toxins (D)
1	Hydrochloric Acid (Aerosols)	589,566,802	
2	Methanol	195,841,453	N
3	Sulfuric Acid (Aerosols)	193,610,776	
4	Nitrate Compounds	172,547,789	
5	Ammonia	162,786,085	N
6	Toluene	98,178,314	N, D
7	Hydrogen Fluoride	80,362,323	N
8	Xylene (Mixed Isomers)	68,445,548	N
9	N-Hexane	66,710,074	N
10	Chlorine	60,260,970	N
11	Styrene	53,621,860	N
12	Methyl Ethyl Ketone	46,618,434	N
13	Carbon Disulfide	43,448,075	N, D
14	Dichloromethane	40,305,157	N
15	Certain Glycol Ethers	37,339,214	
16	Ethylene	30,711,082	N
17	Phosphoric Acid	28,943,730	N
18	N-Butylalcohol	21,514,719	
19	Carbonyl Sulfide	19,356,525	N
20	Propylene	16,450,334	
		Total Number of Developmental or Neurotoxins	**14**

14 out of 20 of the chemicals with the highest releases are developmental or neurotoxins, and account for 51 percent of releases of the top 20 released chemicals.

Source: U.S. EPA's Toxics Release Inventory, 1998

Where

Louisiana and Texas lead the nation in the air and water emissions of developmental and neurological toxins, with most of the pollution in those states coming from chemical manufacturing, petroleum refining, and paper manufacturing. Following Louisiana and Texas as the leading states with the highest air and water emissions of developmental and neurological toxins are Tennessee, Utah, Ohio, Alabama, Indiana, and Illinois. *(See supplemental state material for specific data on each state.)*

Who

Table 6: Top Facilities for Air and Water Releases of Developmental and Neurological Toxins, 1998

Rank	Facility Name	City	State	Industry
1	Magnesium Corp. of America	Rowley	UT	Primary Metal Industries
2	PCS Nitrogen Fertilizer L.P.	Geismar	LA	Chemicals and Allied Products
3	Lenzing Fibers Corp.	Lowland	TN	Chemicals and Allied Products
4	IMC-Agrico Co. Faustina Plant	Saint James	LA	Chemicals and Allied Products
5	Acordis Cellulosic Fibers Inc.	Axis	AL	Chemicals and Allied Products
6	International Paper	Hampton	SC	Rubber and Miscellaneous Plastics Products
7	CF Inds. Inc.	Donaldsonville	LA	Chemicals and Allied Products
8	Alliedsignal Inc. Hopewell Plant	Hopewell	VA	Chemicals and Allied Products
9	PCS Nitrogen Fertilizer L.P.	Millington	TN	Chemicals and Allied Products
10	Elkem Metals Co.	Marietta	OH	Primary Metal Industries
11	Aguaglass Corp.	Adamsville	TN	Rubber and Miscellaneous Plastics Products
12	Devro-Teepak Inc.	Danville	IL	Rubber and Miscellaneous Plastics Products
13	Millennium Inorganic Chemicals Inc. - Plt 2	Ashtabula	OH	Chemicals and Allied Products
14	Boise Cascade Corp.	Deridder	LA	Paper and Allied Products
15	Westvaco Corp. Bleached Board Div.	Covington	VA	Paper and Allied Products
16	ADM Bioproducts	Decatur	IL	Chemicals and Allied Products
17	Triad Nitrogen Inc.	Donaldsonville	LA	Chemicals and Allied Products
18	International Paper	Mansfield	LA	Paper and Allied Products
19	PCS Nitrogen of Ohio L.P.	Lima	OH	Chemicals and Allied Products
20	Royal Oak Ent. Inc., Ellsinore Mo.	Ellsinore	MO	Chemicals and Allied Products

Source: U.S. EPA's Toxics Release Inventory, 1998

Why

The top developmental and neurological toxins are used in common industrial processes. Only three substances account for 97% of all pollution from developmental toxins. The toxins with the highest releases were toluene (a common degreaser and solvent, linked to fetal toxicity), carbon disulfide (used to manufacture synthetic fibers, linked to fetal toxicity), and benzene (widely used in manufacturing and as a component in gasoline, linked to developmental delays).

Table 7: Top 20 Developmental Toxins* Released to Air and Water (of 45 total), 1998

Rank	Chemical Name	Air Emissions and Surface Water Discharges (pounds)
1	Toluene	98,178,314
2	Carbon Disulfide	43,448,075
3	Benzene	7,694,967
4	Bromomethane	1,559,158
5	2-Methoxyethanol	1,028,695
6	Ethylene Oxide	614,777
7	Cyclohexanol	300,955
8	Epichlorohydrin	198,623
9	2-Ethoxyethanol	88,766
10	Sodium Dimethyldithiocarbamate	26,799
11	Potassium	25,260
12	Dimethyldithiocarbamate	10,051
13	1,2-Dibromoethane	7,552
14	Lithium Carbonate	6,578
15	Metham Sodium	4,864
16	Nabam	2,182
17	2,4-Dinitrotoluene	2,123
18	Ethyl Dipropylthiocarbamate	1,566
19	Bromoxynil Octanoate	1,439
20	Urethane	1,160

* The known or suspected developmental toxins included in this report were identified by the California Environmental Protection Agency (http://www.oehha.ca.gov/prop65.html).

Source: U.S. EPA's Toxics Release Inventory, 1998

The most released neurotoxins were methanol (used in paper manufacturing, linked to nerve damage and blindness), ammonia (used in much chemical manufacturing, linked to memory loss), toluene (linked to confusion, memory loss, and other neurological effects at both high and low levels), hydrogen fluoride (used in manufacturing and as a cleaner, linked to nerve damage), xylene (used as a solvent and cleaning agent, linked to impaired memory and muscle coordination) and n-hexane (industrial solvent, also used to refine vegetable oil, linked to nerve damage).

Table 8: Top 20 Neurotoxins* Released to Air and Water (of 278 total), 1998

Rank

Potentially Disproportionate Impacts on African American Children

Children from minority or low-income communities are typically at greater risk of exposure to toxic substances. African American, Hispanic, and Native American children are over-represented in the three to four million children (one out of every four American children) who live within one mile of a National Priorities List hazardous waste site. A number of studies have demonstrated increased levels of premature births in communities that are proximate to hazardous waste sites or facilities.[15] Several studies have confirmed racial disparities in the citing of industrial and hazardous waste facilities.

Beyond these statistics, children from low-income neighborhoods and living in poorly maintained housing, for example, have a higher level of exposure to lead from flaking lead-based paint. Moreover, many children who attend dilapidated schools or live in distressed housing often find themselves in pest-ridden environments where chemical pesticides are frequently applied.
An analysis of the top counties in the U.S. for releases of developmental toxins also reveals a

disproportionate impact on a minority group—in this case African Americans. Since emissions of neurotoxins are much more pervasive than those of developmental toxins, this analysis focused on the top 25 counties for releases of developmental toxins. Because that group of counties was responsible for the release of 46% of all the reported developmental toxins in the country, looking at the top counties provides a meaningful snapshot of where a significant proportion of this class of toxins is released.

This analysis reveals that African American populations in 14 of 25 of the top releasing counties exceed the U.S. average. In other words, African Americans are over-represented in many of the counties most polluted by developmental toxins.[16]

Table 9: Top 25 Counties for Air Emissions of Developmental Toxins and African American Population Figures

		African American Population	
State	County	Number	Percent
AL	Mobile County	117,816	30.83

V. Developmental and Neurological Effects in Children—Incidence and Potential Trends

d82olluting 2 5yr Future:

may be due to increased diagnosis and part to increased incidence. Without additional data over a longer period of time, it will be difficult to make specific determinations.[27]

- The number of infants born with obstructive genito-urinary defects (complete or partial blockage in the opening of the urinary tract) increased 1.6 times over eight years (1990-1997). Once again, more information will be needed to determine specific causes of the increase.[28]

For more information about additional increases of specific birth defects recorded in individual states or regions of the country, see "Healthy from the Start," Pew Environmental Health Commission, November 1999 (http://pewenvirohealth.jhsph.edu/html/reports/menu.html).

Behavioral and Learning Disorders

Animal studies and some human studies show that exposure to some organic solvents as well as dioxins and PCBs during development can cause hyperactivity, attention deficits, reduced IQ, and learning and memory deficiencies. Exposures to common chemicals like toluene, trichloroethylene, xylene, styrene, and manganese during pregnancy can cause learning and behavioral deficiencies in offspring.

Many researchers believe they are seeing an epidemic of learning and behavioral disabilities among children. Upward trends—often reported anecdotally by teachers and child care providers—may be attributed to real increases, improved detection, or improved reporting. Most researchers believe they are likely the result of some combination of the three. Still, only limited quantitative information is available about these types of health problems:

- The number of children in special education programs classified with learning disabilities increased 191% from 1977 to 1994.[29]
- One study showed a doubling of autism prevalence between 1966 and 1997. Statistics kept within the state of California roughly track that result with a 210% increase in the number of children receiving services for autism.[30]
- Attention deficit hyperactivity disorder (ADHD) is conservatively estimated to affect 3 to 6% of all school children. Some recent evidence suggests that the prevalence may be as high as 17%.[32]

A National Success Story: Reducing Exposure to the Neurotoxin Lead

The elimination of lead from gasoline and paint may be one of the most significant public health and educational advances of the 20th century. Research now equates a 10-point drop in blood lead levels with an average 2.8-point gain in IQ. Since the elimination of lead from gasoline in the U.S., we have witnessed a 15-point drop in mean blood lead levels. This gives every baby born today a gift of an average of four to five additional IQ points. What is that worth economically? In the U.S., conservative calculations suggest that each IQ point is worth about $8,300 in additional lifetime income, which would mean that the 15-point drop in blood lead levels is worth an average of $30,000 in income to each baby born. On a national level, with approximately 4 million babies born every year, the elimination of lead has an economic value of over $100 billion per year for the lifetime income of those children.[31]

- The number of children taking the drug Ritalin for ADHD has roughly doubled every 4-7 years since 1971, reaching its current use of about 1.5 million children.[33]

Additional indications that real increases of behavioral and learning deficits are occurring come from teachers and child care providers who dispute the notion that all increases are the result of better detection or rising expectations. Many professionals who are closest to the problem doubt that disabilities of such magnitude could have escaped notice in the past.

For more information about national trends in behavioral and learning disorders, see "In Harm's Way: Toxic Threats to Child Development," Greater Boston Physicians for Social Responsibility, May 2000 (http://www.igc.org/psr/).

How Much Developmental and Neurological Toxin Pollution Costs Society

Families whose children face even mild physical or mental deficits typically encounter substantial emotional and financial pressures. Studies conducted by the United Cerebral Palsy Association found that average annual expenses for families with children with cerebral palsy reached as high as $10,000 per year.[34]

What's less obvious is the dramatic impact that such deficits can have on society. Developmental, learning, and behavioral disabilities are associated with early dropout from school, substance abuse, unemployment, teen parenting, welfare dependence, and incarceration. Considering only direct costs of medical, developmental, and special education services and the costs of lost work and productivity, the combined estimated cost to the nation of just 18 of the most significant developmental defects in the U.S. is conservatively estimated to exceed $8 billion.[35]

Using the National Academy of Sciences estimate that known toxic exposures cause about 3% of known developmental and neurological deficits, a range of toxic substances, including developmental and neurological toxins, are probably responsible for $240 million in aggregated

VI. Recommendations

There are no national, state or local policies that effectively encourage chemical makers or users to study chemicals in commerce for their developmental or neurological effects in children. And virtually no policies exist to encourage them to find safer substitutes.

Even for those developmental and neurological toxins we know about, manufacturers are not required to inform parents that one or more substances in their hair dye, for example, has been associated with cardiac defects in children;[36] that substances in spot and paint removers have been associated with cleft defects and nervous system defects; [37] or that some household weed killers have been associated with low birthweight.[38]

Finally, there are very little data that would allow public health officials and experts to accurately assess the overall role that developmental and neurological toxins play in the incidence of birth defects and learning and behavioral deficits in U.S. children. While the Centers for Disease Control (CDC) is explicitly funded to monitor substances related to nutrition in the bodies of our children, surprisingly the CDC does not receive funding to monitor for substances—like developmental and neurological toxins—that could cause, in some cases, life-threatening deficits. Because of the lack of federal funds available for this, few states collect meaningful data on the incidence of developmental or neurological effects.

The National Environmental Trust, Physicians for Social Responsibility, and The Learning Disabilities Association recommend the following policies be adopted to address the risk to children from developmental and neurological toxins:

of other chemicals they do report to state and federal TRIs. If reporting thresholds for developmental and neurological toxins were lowered, more information would become available to the public, and releases of these substances would likely be reduced over time.

Regulating Electric Power Plants for Air Pollution. The electric power industry is the nation's largest source of industrial air pollution that is not regulated for toxic chemical emissions. EPA should treat the electric power industry like other major industries and require it to adhere to specific limits on toxic air pollution—including developmental and neurological toxins such as mercury, toluene, benzene, hydrogen fluoride, and nickel.

Exposure and Disease Monitoring. To allow public health officials and environmental regulators to assess the real effects of toxic chemicals on U.S. children, a program should be implemented to: (1) monitor developmental and neurological toxins in the bodies of representative samplings of children and women, and (2) record the incidence of developmental and neurological disabilities in the general population.

Polluting Our Future:

Chemical Name	Developmental Toxin (D) or Neurotoxin (N)
1,1,1-TRICHLOROETHANE	N
1,1,2,2-TETRACHLOROETHANE	N
1,1,2-TRICHLOROETHANE	N
1,1-DICHLORO-1-FLUOROETHANE	N
1,1-DIMETHYL HYDRAZINE	N
1,2,3-TRICHLOROPROPANE	N
1,2,4-TRICHLOROBENZENE	N
1,2,4-TRIMETHYLBENZENE	N
1,2-DIBROMOETHANE	D, N
1,2-DICHLOROBENZENE	N
1,2-DICHLOROETHANE	N
1,2-DICHLOROETHYLENE	N
1,2-DICHLOROPROPANE	N
1,3-BUTADIENE	N
1,3-DICHLOROPROPYLENE	N
1,4-DICHLORO-2-BUTENE	N
1,4-DICHLOROBENZENE	N
1,4-DIOXANE	N
2,4-D	N
2,4-D 2-ETHYLHEXYL ESTER	N
2,4-D BUTOXYETHYL ESTER	N
2,4-D BUTYL ESTER	N
2,4-D SODIUM SALT	N
2,4-DB	D
2,4-DIMETHYLPHENOL	N
2,4-DINITROPHENOL	N
2,4-DINITROTOLUENE	D, N
2,6-DINITROTOLUENE	D, N
2-ETHOXYETHANOL	D, N
2-MERCAPTOBENZOTHIAZOLE	N
2-METHOXYETHANOL	D, N
2-METHYLLACTONITRILE	N
2-METHYLPYRIDINE	N
2-NITROPHENOL	N
2-NITROPROPANE	N
2-PHENYLPHENOL	N
4,4'-ISOPROPYLIDENEDIPHENOL	N
4,4'-METHYLENEBIS(2-CHLOROANILINE)	N
4,4'-METHYLENEDIANILINE	N
4,6-DINITRO-O-CRESOL	N
4-AMINOBIPHENYL	N
4-NITROPHENOL	N
ACEPHATE	N
ACETALDEHYDE	N
ACETONE	N
ACETONITRILE	N
ACROLEIN	N
ACRYLAMIDE	N
ACRYLONITRILE	N
ALDICARB	N

2225 T7L-FLA7 EST
2,4A5.9(U1(UOBISAL(FUME OR DUST3968N)]-7425266N)]TJ
4,4ANTIMTRY396857(N)]TJT*[(2,6ARSENIC3015.3(N)]TJT*-0
1,2.7(U56AR SA202 5 T]TJT*-0.0001 Tc[(A)3Z)1A7 B
1,2ZN549.8(,)-223.6(N)]TJT*-0.0002 Tc[(2225 Tw[(2,4Z)12((N)
2225 T6[(2,4Z)12(1(X)1OIC CHL)32(O(.()24)-1267890N)]TJT*
20[(2,4ZIFENTHf0D2023021]TJT*-0.0[(A)3Z5.96.()YL)-9950.66
2,4Z(2-CHL)32(OR)24.2(O)43-1THYLENEDLENEorN

Chemical Name	Developmental Toxin (D) or Neurotoxin (N)
BROMINE	N
BROMOCHLORODIFLUOROMETHANE	N
BROMOFORM	N
BROMOMETHANE	D, N
BROMOTRIFLUOROMETHANE	N
BROMOXYNIL	D
BROMOXYNIL OCTANOATE	D
CADMIUM	N
CAPTAN	N
CARBARYL	N
CARBOFURAN	N
CARBON DISULFIDE	D, N
CARBON TETRACHLORIDE	N
CARBONYL SULFIDE	N
CARBOXIN	N
CATECHOL	N
CHLORDANE	N
CHLORINE	N
CHLOROBENZENE	N
CHLORODIFLUOROMETHANE	N
CHLOROETHANE	N
CHLOROFORM	N
CHLOROMETHANE	N
CHLOROPICRIN	N
CHLOROPRENE	N
CHLOROTHALONIL	N
CHLORPYRIFOS METHYL	N
CHLORSULFURON	D
COBALT	N
CREOSOTE	N
CRESOL (MIXED ISOMERS)	N
CUMENE	N

Chemical Name	Developmental Toxin (D) or Neurotoxin (N)
HYDRAMETHYLNON	D
HYDRAZINE	N
HYDRAZINE SULFATE	N
HYDROGEN CYANIDE	N
HYDROGEN FLUORIDE	N
HYDROQUINONE	N
IMAZALIL	N
IRON PENTACARBONYL	N
ISOFENPHOS	N
ISOPROPYL ALCOHOL	N
LEAD	N
LEAD COMPOUNDS	N
LINDANE	N
LINURON	D
LITHIUM CARBONATE	D, N
M-CRESOL	N
M-DINITROBENZENE	D, N
M-XYLENE	N
MALATHION	N
MALONONITRILE	N
MANEB	N
MANGANESE	N
MANGANESE COMPOUNDS	N
MERCURY	N
MERCURY COMPOUNDS	N
MERPHOS	N
METHACRYLONITRILE	N
METHAM SODIUM	D
METHANOL	N
METHOXONE	N
METHOXYCHLOR	N
METHYL ACRYLATE	N
METHYL ETHYL KETONE	N
METHYL HYDRAZINE	N
METHYL IODIDE	N
METHYL ISOBUTYL KETONE	N
METHYL ISOTHIOCYANATE	N
METHYL METHACRYLATE	N
METHYL PARATHION	N
METHYL TERT-BUTYL ETHER	N
METHYLENE BROMIDE	N
MOLINATE	N

Chemical Name	Developmental Toxin (D) or Neurotoxin (N)
MOLYBDENUM TRIOXIDE	N
MONOCHLOROPENTAFLUOROETHANE	N
MYCLOBUTANIL	D
N,N-DIMETHYLANILINE	N
N,N-DIMETHYLFORMAMIDE	N
N-HEXANE	N
N-METHYL-2-PYRROLIDONE	N
N-METHYLOLACRYLAMIDE	N
N-NITROSODIMETHYLAMINE	N
NABAM	D
NAPHTHALENE	N
NICKEL	N
NICOTINE AND SALTS	N
NITRAPYRIN	D
NITROBENZENE	N
NITROGLYCERIN	N
O-ANISIDINE	N
O-CRESOL	N
O-DINITROBENZENE	D, N
O-TOLUIDINE	N
O-XYLENE	N
OXYDIAZON	D
OZONE	N
P-CRESOL	N
P-DINITROBENZENE	D, N
P-NITROANILINE	N
P-PHENYLENEDIAMINE	N
P-XYLENE	N
PARALDEHYDE	N
PARAQUAT DICHLORIDE	N
PARATHION	N
PEBULATE	N
PENTACHLOROETHANE	N
PENTACHLOROPHENOL	N
PHENOL	N
PHENYTOIN	D, N
PHOSPHINE	N
PHOSPHORIC ACID	N
PHOSPHORUS (YELLOW OR WHITE)	N
PHTHALIC ANHYDRIDE	N
PICRIC ACID	N
PIPERONYL BUTOXIDE	N

Chemical Name	Developmental Toxin (D) or Neurotoxin (N)
POLYBROMINATED BIPHENYLS	N
POLYCHLORINATED BIPHENYLS	N
POTASSIUM DIMETHYLDITHIOCARBAMATE	D
PROFENOFOS	N
PROMETRYN	N
PROPACHLOR	N
PROPANIL	N
PROPARGITE	D
PROPARGYL ALCOHOL	N
PROPETAMPHOS	N
PROPIONALDEHYDE	N
PROPOXUR	N
PROPYLENE OXIDE	N
PYRIDINE	N
QUINOLINE	N
QUINONE	N
S,S,S-TRIBUTYLTRITHIOPHOSPHATE	N
SAFROLE	N
SELENIUM	N
SELENIUM COMPOUNDS	N
SIMAZINE	N
SODIUM AZIDE	N
SODIUM DIMETHYLDITHIOCARBAMATE	D
SODIUM NITRITE	N
STYRENE	N
STYRENE OXIDE	N
SULFURYL FLUORIDE	N
TEBUTHIURON	N

Chemical Name	Developmental Toxin (D) or Neurotoxin (N)
TEMEPHOS	N
TERT-BUTYL ALCOHOL	N
TETRACHLOROETHYLENE	N
TETRACYCLINE HYDROCHLORIDE	D
THALLIUM	N
THIABENDAZOLE	N
THIODICARB	N
THIOPHANATE-METHYL	D, N
THIRAM	N
TOLUENE	D, N
TOLUENE DIISOCYANATE (MIXED ISOMERS)	N
TOLUENE-2,4-DIISOCYANATE	N
TOXAPHENE	N
TRIADIMEFON	D, N
TRIALLATE	N
TRIBUTYLTIN METHACRYLATE	N
TRICHLOROETHYLENE	N
TRICHLOROFLUOROMETHANE	N
TRIETHYLAMINE	N
URETHANE	D
VINCLOZOLIN	D
VINYL ACETATE	N
VINYL BROMIDE	N
VINYL CHLORIDE	N
VINYLIDENE CHLORIDE	N
XYLENE (MIXED ISOMERS)	N
ZINC (FUME OR DUST)	N
ZINEB	N

Appendix C

References Used to Identify Known or Suspected Neurotoxins

Source: Environmental Defense, Scorecard

AEGL: US EPA, National Advisory Committee for Acute Exposure Guideline Levels for Hazardous Substances. Notices. 62 Federal Register: 58839-58851 (October 30, 1997).

CAA-AQC: US Environmental Protection Agency, Office of Research and Development. Air Quality Criteria for Carbon Monoxide. Washington, DC, December 1991.

CAPCOA: California Environmental Protection Agency and California Air Pollution Control Officers Association. Air Toxics Hotspots Program Risk Assessment Guidance: Revised 1992 Risk Assessment Guidance and Draft Evaluation of Acute Non-Cancer Health Effects. Office of Environmental Health Hazard Assessment, CalEPA, Berkeley, CA. December 1994 and January 1995. http://www.oehha.org/air/hot_spots/index.html

CARB-TAC: California Air Resources Board. Toxic Air Contaminant Identification List Summaries and Proposed Update to the Toxic Air Contaminant List. Air Resources Board, CalEPA, Sacramento, CA. January 1996 and December 1998. http://www.arb.ca.gov/toxics/tac/tac.htm.

DAN: Nordic Council of Ministers and Danish National Institute of Occupational Health. Neurotoxic Substances in the Working Environment (Danish ad hoc list).

EDF: See EDF's Custom Hazard Identification documentation.

EPA-HEN: US Environmental Protection Agency. Health Effects Notebook for Hazardous Air Pollutants. Review Draft. December 1994. http://www.epa.gov/ttn/uatw/hapindex.html

EPA-SARA: US Environmental Protection Agency. SARA 313 Roadmaps Database. http://www.rtknet.org/

EPA-TRI: US Environmental Protection Agency. Addition of Certain Chemicals; Toxic Chemical Release Reporting; Community Right to Know. Proposed and Final Rules. 59 Federal Register 1788 (Jan 12, 1994); 59 Federal Register 61432 (November 30, 1994).

EVAN: Evangelista, A.M. Behavioral Toxicology, Risk Assessment, and Chlorinated Hydrocarbons. Environmental. Health Perspectives. 104 (Supplement 2): 353-360. 1996. (Table 1: Comparison of behavioral toxicity of chlorinated hydrocarbons and related compounds).

FELD: Feldman, R.G. Role of the Neurologist in Hazard Identification and Risk Assessment. Environmental Health Perspectives. 104 (Supplement 2):227-237. 1996. (Table 1: Neurologic symptoms and associated exposures).

HEAST: EPA, Office of Research and Development. Health Effects Assessment Summary Tables.

Endnotes

1 Scientific Frontiers in Developmental Toxicology and Risk Assessment, National Academy of Sciences, June 2000, p. 19-20. http://www.nap.edu/books/0309070864/html/

2 See U.S. EPA Guidelines for Neurotoxicity Risk Assessment, http://www.epa.gov/ncea/pdfs/nurotox.pdf.