By Tim Montague

"Sixth grade was a trying time for Karen Singer's autistic son, who spent recess wandering the periphery of the playground by himself and sometimes hid in the school bathroom when he needed a safe place to cry. He knew he was doing something wrong as he reached the social crucible of middle school, but he did not know how to fix it. At home he begged his mother to explain: "Why am I like this? What's wrong with me?" ...Parents, educators, researchers and clinicians all say that the majority of such children become conspicuous in the third grade and are bullied or ostracized by the time they reach middle school."[1]  

Developmental disabilities such as autism, attention deficit hyperactivity disorder (ADHD), dyslexia and uncontrollable aggression currently affect an estimated 12 million U.S. children under age 18 -- almost one child in five. A group of public health scientists led by Dr. Susan Koger estimates that between 3 and 25% of all developmental disabilities result from exposure to neurotoxic chemicals in the environment.[2] These disabilities ultimately impact all aspects of human development -- our ability to learn, socialize and become productive members of society.

Reading and writing difficulties affect nearly 4 million school-age children. Disabilities in children pose lifelong difficulties for the affected individuals. It is harder for them to keep jobs, learn new skills, work and generally get along with others. Many developmental disabilities (like aggression and impulsivity) are precursors to violent and criminal behavior. In 2004, the U.S. prison/jail population increased at the rate of 933 each week and 75% of these new inmates were black or Hispanic -- populations disproportionately impacted by heavy metals and other toxicants.[3]  

Costs to Society

Even if the developmental effects of environmental toxicants are subtle (which is not always the case), the economic and social impacts can be profound. Consider reduced intelligence: If the cumulative effects of environmental toxicants reduced the average American's IQ by just one percent (about one IQ point) the annual cost to society would come to $50 billion and the lifetime costs to trillions"[4]. The impacts are felt at both ends of the intelligence spectrum -- there is a greater burden on the social system, reduced productivity en masse, and there are fewer shining stars to discover new and better ways of living sustainably.

Mercury emissions from power plants alone impact approximately 500,000 children each year in the U.S. Their resulting lowered IQ translates into an annual economic loss of $1.3 billion (in 2000 dollars; this estimate is $8.7 billion if you consider all sources of environmental mercury).[5] And these statistics say nothing of the other costs to society including medical/therapeutic treatment, special education, incarceration, addiction counseling, etc.

Meanwhile, industry and government argue that its not economically viable to take a precautionary approach. As a result, Americans spend between $81 and 167 billion dollars each year on neurodevelopmental deficits, hypothyroidism and related disorders.

The Bush administration actively puts down European initiatives like REACH (Registration, Evaluation and Authorization of Chemicals) that would force industry to evaluate the safety of chemicals prior to their marketing to the general public. This kind of precautionary stance might cost the U.S. $30 billion in lost sales of chemicals and products.[6] One study concluded that today's generation of newborns has a $110 to $318 billion GREATER earning capacity as a result of NOT being exposed to the levels of lead faced by infants a generation ago.[7]  

Toxicants' Effect on the Developing Child

Growing children are particularly at risk to chemicals in their environment because they face greater exposure and are physiologically more susceptible. They ingest more food/water per pound of body weight than adults. Children spend more time near the ground and thus breathe up to ten times more dust and residues than adults. Children also put contaminated items in their mouths. When the National Academy of Sciences studied pesticides and children's health in 1993, the Academy concluded, "A fundamental maxim of pediatric medicine is that children are not 'little adults'... In the absence of data to the contrary, there should be a presumption of greater toxicity to infants and children."[8]

Dr. Koger reviews some of the literature on lead, mercury and pesticides: We now know that environmental exposure to lead causes learning disabilities, reduced IQ, attention deficit, impulsivity, hyperactivity and violent behavior. Initially scientists believed that there was a threshold for lead toxicity but recent studies have confirmed that there is no safe level of lead exposure. If you ingest lead your IQ will be reduced. In the mid-1970s, 40% of American children under age 5 had average (mean) lead levels of 20 ug/dl or more. 10 ug/dl blood lead is the current safety threshold established by EPA. Among African-American children in the mid-1970s, more than half had blood-lead levels greater than 15 ug/dl.[9]

Methylmercury (an organic form of mercury that accumulates in fish and the animals that eat fish) acts directly on the central nervous system by damaging or destroying nerve cells. It impairs brain development and can lead to mental...
retardation, cerebral palsy, lowered IQ, loss of memory, reduced attention span and physical coordination. The FDA and EPA currently recommend that nursing mothers and young children avoid fish known to have high mercury levels (including albacore tuna, shark, swordfish, and king mackerel).[5] The major sources of environmental mercury are coal burning power plants, waste incinerators and volcanoes. Human sources account for 70% of the 5,500 metric tons (12.1 million pounds) of mercury released into the environment each year.[5] The EPA estimates that 1.16 million women of childbearing age "eat sufficient amounts of mercury-contaminated fish to pose a risk of harm to their future children."[10]

Pesticides are toxic by design and meant to kill weeds, insects, rodents and other pest organisms; they do so by impairing the nervous and immune system function. Many pesticides and their byproducts (which include PCBs) are highly toxic, persistent and bioaccumulative in humans. Because our nervous system shares basic physiology with other living things, pesticides also harm the human nervous and immune systems [see Rachel's #660]. Of the 140 pesticides officially known to be neurotoxicants, only 12 (8.5%) have been tested for potential impacts on children's development.[10] A study of Mexican children exposed to pesticides found impaired memory, creativity and motor skills compared to an unexposed population. The pesticide exposed children had trouble drawing an ordinary stick figure of a human, something the unexposed children could readily do.[11]

Limits of Science

Koger identifies six reasons why it is inherently difficult to document a cause-effect relationship between toxicants and impaired health:

1. Lack of a control group -- because environmental toxicants are so widespread, it is difficult (though not impossible) to find unexposed groups for comparison with exposed individuals;

2. Multiple chemical exposure -- the interaction between chemicals may cause different effects than a chemical acting alone;

3. Behavioral and cognitive effects are typically subtle and difficult to measure;

4. The majority of research on toxicants is done on lab animals which limits their application to human health;

5. The effects of exposure may not be seen for months or years;

6. The brain and other systems of the human body are more susceptible to chemicals during specific development phases -- exposure at one time may have no effect while the same exposure at a different developmental stage could have significant effects; and

7. Genetic variation and gene-environment interactions greatly complicate the matter.

Conclusions and Regulatory Issues

Humans have long recognized the potential harm of environmental chemicals to child development. Unfortunately, regulatory efforts focus on proving harm before limiting the exposure of countless innocents, with the associated cascade of health, social and economic losses. When the U.S. finally banned lead in paint and gasoline, blood levels of lead improved dramatically. But left to its own devices, industry will do what is best for industry -- pursue profits for shareholders at any cost (see Rachel's #771, #419, #421, and #427). The alternative is to take a proactive approach like that being pursued by Sweden which calls for new products to be largely free from (a) persistent and bioaccumulative substances; (b) polyvinyl chloride (PVC) plastics and endocrine (hormone system) disruptors; (c) heavy metals like lead, cadmium and mercury.[2] The U.S. is currently standing on the sidelines of this significant ethical and technological advancement for society.

Dr. Koger calls on her colleagues in the scientific/mental health professions to take a stand against the historical risk-assessment- reliant prove-harm approach that costs society so much human suffering and misery. The grand human experiment currently being conducted by industry is inconsistent with the ethical standards applied to pharmaceutical testing where erring on the side of precaution is customary.

Koger urges psychologists -- as the most qualified front-line professionals dealing with the problems of developmental disabilities -- to play a more active role in exploring alternatives like integrated pest management, speaking out in their local community, and applying their technical expertise to the widespread and growing problem of environmental toxicants. As scientist-citizens psychologists can reduce the toxic burden shared by all. A healthy and sustainable future for our children depends on it.


