LEARNING AND DEVELOPMENTAL DISABILITIES INITIATIVE

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Body of Evidence - Report on PBDEs (February 2004)

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EXECUTIVE SUMMARY

New evidence indicates that the chemical flame retardant decabromodiphenyl ether (Deca) may threaten the health of Americans.

Manufacturers of common household products add Deca to plastics or fabrics to make them resist the spread of fire. A growing body of evidence shows that exposure to Deca may cause adverse health effects in developing children, including damage to the nervous system and impaired motor skills. New research also indicates Deca can break down into the types of flame retardants recently banned in the European Union and California because of their bio-accumulative and toxic properties.

Unfortunately, the story of Deca is not unique. Deca is one of many potentially hazardous chemicals that are in widespread use, due to a failed national policy that presumes chemicals are safe until proven beyond a doubt to cause harm.

Toxic flame retardants are commonly added to household products.
Deca is the most heavily used member of a class of flame retardants known as polybrominated diphenyl ethers, or PBDEs. There are three main types of commercially used PBDEs: Penta, Octa, and Deca. Deca is added to products used in the home, in travel, and in the workplace, including televisions, stereos, computers, hair dryers, toasters, draperies, and upholstery fabrics. These materials contain as much as 5-30 percent Deca by weight. In 2001 alone, North American industry used 49 million pounds of Deca, accounting for almost half the world market.

The European Union and California banned Penta and Octa flame retardants because they pose a threat to human health.
The European Union has developed a policy banning the use of all PBDEs (Penta, Octa, and Deca) in consumer electronics beginning in mid-2006 and banning the marketing and use of the Penta and Octa products in all sectors beginning in mid-2004. In 2003, the state of California followed suit, banning use and distribution of Penta and Octa. A few months later, the largest U.S. manufacturer of these two chemicals announced a national phase-out of their production.

Numerous laboratory studies point to potential health effects from exposure to Penta and Octa flame retardants:

- Infant mice exposed to these toxic flame retardants suffer disrupted brain development, permanently impairing learning and movement.
- Components of Penta and Octa are rapidly building up inside people. American women's breast milk and breast tissue contain some of the highest levels of PBDEs found in any population in the world.
- Human contamination levels leave little margin of safety. PBDEs found in some mothers and fetuses are rapidly approaching the levels shown to impair learning and behavior in lab testing.

Contrary to industry claims, Deca also poses a threat to human health.
Deca escapes into the environment because it is not chemically bound to products to which it is added. Within the home, Deca has been found in household dust and as a film coating the surfaces of windows. It also escapes from products in landfills to spread through air and water.

- *Deca decomposes into forms that are more toxic and more easily absorbed by the body.* Although Deca itself is less easily absorbed by the body than other PBDEs, lab experiments have demonstrated that Deca can break down and convert to more dangerous forms, including the Penta and Octa scientists have found rapidly accumulating in our bodies. New evidence also indicates that Deca decomposes in sunlight and ultraviolet light and within the bodies of animals.

- *Deca itself has been found in animals and humans.* The chemical industry has asserted that the Deca molecule is too large to be efficiently taken up by organisms. However, Deca has been found in peregrine falcons, in workers at electronics recycling plants, in regular citizens in the U.K., and in the breast milk of mothers in the United States. One recent study of American women's breast milk found levels of Deca in 16 of 20 women tested. A study from the University of Texas found a maximum level of Deca 40 times higher than industry's estimated maximum body burden for women who disassemble Deca-containing computers for a living.

- *Deca itself may be neurotoxic.* Recent research also has revealed that Deca exhibits some of the same toxic properties as Penta and Octa. When infant lab animals are exposed to Deca during a key period of development, they develop permanent damage to their nervous systems, resulting in impaired motor skills. This damage worsens with age.

Safer means of fire-proofing products are widely available.
Leaders in the furniture, plastic, and electronics industries already have manufactured products that meet fire-safety standards without the use of Deca. Strategies for flame-resistance include using better product design, inherently non-flammable materials, or alternative flame-retardant chemicals. For example, Ericsson, which manufactures cell phones and other electronics, has banned Deca and other PBDEs from its products and applications and found replacements at comparable cost.

U.S. chemicals policy compromises public health.
In the U.S. alone, tens of thousands of industrial chemicals are on the market with little or no information about potential health impacts. Where significant evidence of harm to public health exists, inadequate resources and legal authority prevent regulatory agencies from taking protective action.

Recommendations
Phase Out Toxic Flame Retardants
Despite remaining data gaps about the hazards of Deca, the U.S. and California should take action based on current evidence. Given the scientific studies showing that Deca accumulates in humans, breaks down into more hazardous chemicals, and potentially harms brain development, the United States and California should phase out the use of Deca and other brominated flame retardants—especially given the availability of viable alternatives.

Reform Chemicals Policy
U.S. and California chemicals policy should ensure that manufacturers and industrial users provide regulatory agencies and the public with adequate information about their products, so that agencies can act to protect public health from potentially dangerous substances *before* damage is done. Chemicals that are untested or

known to be hazardous should not be allowed on the market or in widespread use and distribution. In addition, the costs of developing analytical methods and testing for chemicals' safety should fall to the manufacturers who stand to profit from the product. In the absence of adequate data, the U.S. and California must take measures to prevent exposure to chemicals when there is evidence of potential harm.

Introduction

Despite advances in modern medicine, many chronic diseases are on the rise. Recently, the National Cancer Institute found that cancer rates have increased over the past decade, despite past reports of declining or unchanging rates.[1] Cognitive development experts report that learning disabilities have risen 191% between 1977 and 1994, while the California Department of Developmental Services reports an apparent 210% increase in rates of autism over the last decade.[2] Additionally, it is reported that one in eight children is born prematurely; nationwide, the rate of premature births appears to have jumped 29 percent since 1981.[3]

The apparent increase in chronic illnesses in the country coincides with an explosion of industrial chemical synthesis and use. Modern industry has created more than 75,000 chemicals, used in manufacturing processes and incorporated in everyday consumer products. The modern human lives in an environment filled with complex mixtures of these chemicals, affecting human health and development in untold ways. Most of these chemicals have not been studied sufficiently to prove lack of harm. The health effects of almost half of the major industrial chemicals have not been studied at all.[4]

While it is virtually impossible to connect a single chemical to a broad health trend, the National Academy of Sciences estimates that chemical exposures play a role in at least 1 in 4 cases of developmental disorders.[5]

How did we get into this situation? First, current policy does not require that chemicals already on the market be tested sufficiently for health effects, particularly chronic effects, nor does it require any action if harm is found. American chemical regulation apparently takes an "innocent until proven guilty" approach, allowing widespread exposure to toxic chemicals before they have been tested for safety. The burden of proving harm remains on those who suffer the harm—the public.

Second, the government probably needs to do more to regulate the use and release of toxic chemicals and to identify new ones. According to the Toxic Release Inventory, industry discharges tens of millions of pounds of chemicals into California's environment every year. Additionally, manufacturers include millions of pounds of these industrial chemicals in consumer products, from computers to shower curtains to light bulbs.

Meanwhile, an ongoing chemical industry campaign understandably attempts to convince the public that chemicals are safe and are tested for safety before being placed on the market.[6]

The case of PBDEs illustrates the shortcomings of federal and state chemical regulatory policies. Introduced as a fire safety product without adequate health testing, the toxic flame retardants known as polybrominated diphenyl ethers (PBDEs) have now spread to every corner of the globe and are building up in human bodies. New research in lab animals links exposure to these chemicals during a critical window of brain development to neurological impairment and reproductive damage. The European Union and

California have imposed new restrictions on the marketing and use of these chemicals, and one U.S. manufacturer has pledged to phase out two types of toxic flame retardants by 2005.

However, the toxic flame retardant story is not over. Industry continues to assert that the third and most heavily used type of PBDE, decabromodiphenyl ether (Deca), is safe. This report catalogs the emerging evidence that this third chemical may pose a threat to children's health.

There is a lesson to be learned here. It seems unwise that chemicals are "presumed innocent" and used widely when there is inadequate study of their health effects, persistence, or bio-accumulative qualities.

Alternative models of chemicals policies do exist. Several Scandinavian countries have based chemical regulation on prevention, requiring thorough testing. The European Union recently introduced a draft policy known as REACH (Registration, Evaluation, and Authorization of

Chemicals) that will require safety testing of thousands of chemicals that are already on the market.

We must do more to remove unnecessary health risks from our workplaces, our communities, our schools, and our homes. Investigating potential hazards and taking action to protect health when threats are discovered can lead to a world that is both safe and healthy for our children.

Kim Hooper, PhD
Hazardous Materials Laboratory
Department of Toxic Substances Control
Cal/EPA

[a] Limin X. Clegg, Eric J. Feuer, Douglas N. Midthune, Michael P. Fay, Benjamin F. Hankey, "Impact of Reporting Delay and Reporting Error on Cancer Incidence Rates and Trends," *J Natl Cancer Inst,* Vol. 94, No. 20, October 16, 2002.

[a] Learning disabilities: KA Kavale , SR Forness, and CT Ramey, "Co-variants in learning disability and behavior disorders: An examination of classification and placement issues," *Advances in Learning and Behavioral Disabilities* 12:1-42, 1998; as cited in: Ted Schettler et al., Physicians for Social Responsibility and the Clean Water Fund, *In Harm's Way: Toxic Threats to Child Development*, May 2000; Autism increase: Thomas Maugh, "State Study Finds Sharp Rise in Autism Rate," *Los Angeles Times*, 16 April 1999.

[a] March of Dimes, "Premature Birth Rate in U.S. Reaches Historic High; Now Up 20 Percent Since 1981," Press Release, downloaded from http://www.marchofdimes.com/aboutus/10651_10763.asp, 3 February 2004.

[a] U.S. EPA, Chemical Information Collection and Data Development (Testing), *Chemical Hazard Data Availability Study, 2002.*

[a] National Research Council Commission on Life Sciences, *Scientific Frontiers in Developmental Toxicology and Risk Assessment,* January 2000.

[a] See, for example, the American Chemistry Council's "2003 Year in Review" Report, available at www.accnewsmedia.com.

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[a] Affiliation included for identification purposes only. Content and opinion do not necessarily reflect the views of the California Environmental Protection Agency.

[1] Limin X. Clegg, Eric J. Feuer, Douglas N. Midthune, Michael P. Fay, Benjamin F. Hankey, “Impact of Reporting Delay and Reporting Error on Cancer Incidence Rates and Trends,” *J Natl Cancer Inst,* Vol. 94, No. 20, October 16, 2002.
[2] Learning disabilities: KA Kavale , SR Forness, and CT Ramey, "Co-variants in learning disability and behavior disorders: An examination of classification and placement issues," *Advances in Learning and Behavioral Disabilities* 12:1-42, 1998; as cited in: Ted Schettler et al., Physicians for Social Responsibility and the Clean Water Fund, *In Harm's Way: Toxic Threats to Child Development*, May 2000; Autism increase: Thomas Maugh, "State Study Finds Sharp Rise in Autism Rate,"