

# Rachel's Environment & Health News

## #603 - Experimenting On Children

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Health authorities in several European countries, including Austria, Belgium, Denmark, Germany, and the Netherlands have recommended a ban on soft PVC toys, such as teething rings and bath toys. The Spanish government requested action by the European Union (EU) in March, 1998. PVC, or polyvinyl chloride (also known as vinyl), is a common plastic that frequently contains toxic additives. Despite its well-publicized goal to "protect children's health," the Clinton administration is lobbying aggressively to avert a European ban on PVC toys.[1]

At issue are a family of chemicals called phthalates (pronounced "thalates"). Phthalates (phthalic esters or benzenedicarboxylic acid esters) are used primarily as plasticizers added to PVC to make it soft and elastic. Plasticizers account for more than half the weight of some flexible PVC products. About 95% of phthalates are used in PVC.[2]

Since they are not chemically bound to the PVC polymer itself, phthalates readily leach out of PVC products. Up to 1% of the phthalate content of PVC products is released each year.[3] As a result of their continuous release during the production, use and disposal of PVC products, phthalates are often described as the "most abundant man-made environmental pollutants." (See REHW #438).

Although phthalates vary in toxicity, the most widely-used phthalates such as DEHP [di(2-ethylhexyl)phthalate] have been linked in animal studies to a variety of illnesses, including reproductive damage and damage to the kidneys and liver.[4] Several agencies, including U.S. EPA [Environmental Protection Agency], have labeled DEHP a probable human carcinogen.[4] One recent study found a strong correlation between testicular cancer and exposure to PVC in workers who make PVC products. The authors of the study suspect that phthalates may play a role in their findings.[5]

Other studies suggest that phthalates or their metabolites can interact synergistically with other common chemical contaminants,[6] may be slightly estrogenic[7] (which means they may play a role as endocrine disrupters), can affect blood pressure and heart rate,[8] and may cause asthma when absorbed on airborne particles.[9]

The simple truth about phthalate toxicity is revealed by the warning label on a bottle of DINP, the phthalate most commonly found in toys. The label on a bottle of DINP sold to an experimental laboratory says, "May cause cancer; harmful by inhalation, in contact with skin, and if swallowed; possible risk of irreversible effects; avoid exposure; and wear suitable protective clothing, gloves, and eye/face protection." [10] On the other hand, a typical PVC teething ring or bath duck containing about 40% by weight of DINP either has no label or carries a label that reads "Non-Toxic."

Although no standard method exists for the investigation of release of phthalates from toys, a group of Danish scientists found significant migration of phthalates used in toys.[11] Soon after, some of Denmark's biggest retailers took precautionary action by pulling a number of chewable PVC toys off their shelves. Since then, a number of retailers in Spain, Sweden Italy, Germany, the Netherlands and Belgium have stopped selling PVC teething toys.

No major U.S. retailers have taken similar precautionary action, chiefly because the U.S. Consumer Product Safety Commission (CPSC), which is responsible for toy safety regulations, has yet to take a position. In the mid-'80s, after the CPSC looked into the leaching of DEHP from teething toys, the toy and chemical corporations deflected restrictions on the use of PVC by voluntarily substituting another phthalate for DEHP.

When the EU was asked to restrict PVC toys, it called upon its own Scientific Committee, which investigated and then issued a report in April 1998. The report acknowledged that the EU's assessment "did not take into account that more than one phthalate may occur in

children's toys or that there may be additional exposures through food, air and by dermal contact to these phthalates." [12] Nevertheless, the EU's Scientific Committee found that two common phthalate plasticizers used to make flexible toys (DINP and DEHP) leached from PVC toys at levels of concern.

Phthalates migrate into food from plastic food wraps. A recent survey of U.S. cheeses by CONSUMER REPORTS magazine found that phthalates and adipates (another PVC plasticizer) directly migrate from commercial PVC and PVDC plastic wrapping into cheeses.[13] "In the cheeses [Consumer Reports] found:

"...very heavy migration (50 to 160 parts per million) of the adipate plasticizer DEHA into cheeses in deli cling wrap. People who ate several ounces of this cheese every day could get doses nearly as high as those linked to a host of health problems in lab animals.

"...moderate migration (1 to 4 parts per million) of the most common phthalate, DEHP, into some of the shrink-wrapped cheeses and into two waxed cheeses with clear plastic overwrap."

The June CONSUMER REPORTS says, "It's impossible to say whether a tiny serving of plasticizers is risky. If you want to play it safe, buy one of the wraps we found to be free of suspect plasticizers, or buy any polyethylene wrap." A sensible recommendation that would help reduce exposure.

The toy and PVC industries point to the use of PVC in medical devices to suggest that its use in toys and food wraps is safe. Yet phthalates DO leach from medical products, often resulting in high exposures to particularly vulnerable individuals, including people with suppressed immune systems, pregnant women, and children. Estimates of exposure levels indicate that hemophiliacs may be exposed to 1 to 2 milligrams per day (mg/day) and dialysis patients may receive doses as high as 40 mg/day. In one study, seven out of twelve samples of lung tissue, taken at autopsy from patients who had received transfusions of stored blood, contained DEHP at concentrations of 13.4 to 91.5 milligrams per kilogram (mg/kg) (dry weight).[14]

Preliminary evidence has linked illnesses to high levels of exposure to phthalates from medical devices. For instance, unusual lung disorders were observed in pre-term infants artificially ventilated with PVC respiratory tubes.[15] Infants in neonatal intensive care units are regularly exposed to DEHP following blood transfusions or respiratory oxygenation. As the authors of one study put it, "whether such exposure leads to increased morbidity is not known, although elevated levels of DEHP have been associated with necrotizing enterocolitis and cholestasis. There is no appropriate risk assessment for neonatal infants who are exposed to this compound." [16]

While high levels of phthalates appear to be leaching from products such as medical devices, toys and packaging (products coming directly in contact with humans or food), these are just a small part of the widespread dispersion of phthalates into the environment. The Swedish EPA estimates that "the greatest spread of phthalates should occur from the outside use of coated fabric and coated plating, and from (automobile) underseal compound. As an estimate, these products are responsible for 90% of phthalate emissions..." [17] Other studies have shown that plasticizers are extracted from PVC flooring when it is washed and from textiles imprinted with PVC.[18] Phthalates are also found in leachate from landfills (released from buried PVC).[19]

Only a total phase-out of flexible PVC products can address the global spread of phthalates. Such a large-scale phase-out is feasible because alternatives exist for nearly every use of PVC.[20] In most cases, the alternatives are cost-effective. For instance, PVC-free intravenous solution bags are cheaper than PVC bags.[21] The plastics industry is also developing a new generation of high-performance polyolefins (chlorine-free plastics such as

polypropylene and polyethylene) which industry analysts contend will soon be cost competitive with PVC in applications "where the plasticizer cost has a significant impact on total end use cost" (for example, flexible PVC with phthalate additives).[22] None of these other plastics requires PVC's extensive use of toxic additives.

Since PVC products are common, the immediate goal should be to change the composition of products that people (especially children) contact directly. Thus, banning PVC teething rings would set an important precautionary precedent. In May the government of Sweden proposed a ban on the use of phthalates in all toys for children under age 3.

As cable traffic between the Department of Commerce and the U.S. EU delegation reveals, the U.S. has pressured the EU to not take any action until studies by the Consumer Product Safety Commission are completed. A draft of the CPSC's report (which relies almost exclusively on data provided by phthalate manufacturers) concludes that DINP can be regarded as toxic under the Federal Hazardous Substances Act but additional information is needed on the release of DINP from children's products before the CPSC could recommend action.[23]

Thus, although there is no standard testing procedure to measure phthalates released when children suck or chew on PVC toys, and though countries such as Denmark, and the EU's Scientific Committee, have concluded that phthalates leach from toys at levels of concern, more data are needed before the CPSC will make up its mind.

Meanwhile, the nation's children are being used as guinea pigs.

--by Charlie Cray

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[1] James Gerstenzang, "U.S. Urges European Union to Avert Toy Restrictions," LOS ANGELES TIMES, May 28, 1998, p. A1.

[2] T.J. Wams, "Diethylhexylphthalate as an Environmental Contaminant-- A Review," SCIENCE OF THE TOTAL ENVIRONMENT Vol. 66 (October 1987), pgs. 1-16.

[3] Cadogan, D.F. and others, AN ASSESSMENT OF THE RELEASE, OCCURRENCE AND POSSIBLE EFFECTS OF PLASTICIZERS IN THE ENVIRONMENT (Brussels, Belgium: European Council for Plasticisers and Intermediates, 1993).

[4] Agency for Toxic Substances and Disease Registry, TOXICOLOGICAL PROFILE FOR DI (2-ETHYLHEXYL) PHTHALATE [TP-92/05] (Atlanta, Ga.: Agency for Toxic Substances and Disease Registry, April, 1993).

[5] Lennart Hardell and others, "Occupational exposure to polyvinyl chloride as a risk factor for testicular cancer evaluated in a case-control study," INTERNATIONAL JOURNAL OF CANCER Vol. 73 (1997), pgs. 828-830.

[6] M.G. Narotsky and others, "Nonadditive Developmental Toxicity in Mixtures of Trichloroethylene, Di(2-ethylhexyl) Phthalate [sic], and Heptachlor in a 5 X 5 X 5 Design," FUNDAMENTAL AND APPLIED TOXICOLOGY Vol. 27 (1995), pgs. 203-216.

[7] Catherine A. Harris and others, "The Estrogenic Activity of Phthalate Esters IN VITRO," ENVIRONMENTAL HEALTH PERSPECTIVES Vol. 105, No. 8 (August 1997), pgs. 802-811. And see Susan Jobling and others, "A Variety of Environmentally Persistent Chemicals, Including Some Phthalate Plasticizers, Are weakly Estrogenic," ENVIRONMENTAL HEALTH

PERSPECTIVES Vol. 103, No. 6 (June 1995), pgs. 582-587.

[8] Gail Rock and others, "Hypotension and cardiac arrest in rats after infusion of mono(2-ethylhexyl)phthalate (MEHP), a contaminant of stored blood," NEW ENGLAND JOURNAL OF MEDICINE Vol. 316 (May 7, 1987), pgs. 1218-1219.

[9] Leif Oie and others, "Residential Exposure to Plasticizers and Its Possible Role in the Pathogenesis of Asthma," ENVIRONMENTAL HEALTH PERSPECTIVES Vol. 105, No. 9 (September 1997), pgs. 972-978.

[10] Matthew Wald, "Lead Content is Found High in Plastic Items," NEW YORK TIMES, October 10, 1997, pg. unknown. And see Joe Di Gangi, LEAD AND CADMIUM IN VINYL CHILDREN'S PRODUCTS (Washington, D.C.: Greenpeace, 1997). Available at <<http://www.greenpeaceusa.org>>.

[11] K. Vinkelsoe and others, "Migration of Phthalates from Teething [sic] Rings," Department for Environmental Chemistry, Danmarks Miljoundersogelser, Frederiksborgvej 399, 4000 Roskilde, Denmark. Telephone +45 4630 1200; fax: +45 4630 1114. April 15, 1997.

[12] PHTHALATES IN TOYS, OPINION OF THE EU SCIENTIFIC COMMITTEE ON TOXICITY, ECOTOXICITY AND THE ENVIRONMENT (Brussels, Belgium: European Union, April 24, 1998).

[13] "Hormone Mimics: They're in our food; should we worry?" CONSUMER REPORTS, June, 1998, pg. 52-55. See also, J.H. Petersen and others, "PVC cling film in contact with cheese: health aspects related to global migration and specific migration of DEHA," FOOD ADDITIVES AND CONTAMINANTS Vol. 12, No. 2 (March 1995), pgs. 245-253.

[14] Charlotte Nilsson, editor, PHTHALIC ACID ESTERS USED AS PLASTIC ADDITIVES, VOLUME 2: COMPARISON OF TOXICOLOGICAL EFFECTS [No. 12/94] (Solna, Sweden: Swedish National Chemicals Inspectorate, 1995[?]). See <[www.kemi.se](http://www.kemi.se)>.

[15] B. Roth and others, "Di-(2-ethylhexyl)-phtthalate as plasticizer in PVC respiratory tubing systems: indications of hazardous effects on pulmonary function in mechanically ventilated, preterm infants," EUROPEAN JOURNAL OF PEDIATRICS Vol. 147 (1988), pgs. 41-46.

[16] S.L. Plonait and others, "Exposure of newborn infants to di-(2-ethylhexyl)-phthalate and 2-ethylhexanoic acid following exchange transfusion with polyvinylchloride catheters," TRANSFUSION Vol. 33, No. 7 (1993), pgs. 598-605.

[17] Swedish National Chemicals Inspectorate, ADDITIVES IN PVC; MARKING OF PVC; REPORT ON COMPLETION OF A GOVERNMENT TASK (Solna, Sweden: Swedish National Chemicals Inspectorate, June 28, 1996)

[18] J. Vikelsoe and E. Johansen, "Phthalates emitted when washing floors and textiles containing PVC." Place of publication and publisher unknown. Cited in Swedish National Chemicals Inspectorate, ADDITIVES IN PVC; MARKING OF PVC; REPORT ON COMPLETION OF A GOVERNMENT TASK (Solna, Sweden: Swedish National Chemicals Inspectorate, June 28, 1996).

[19] Danish Technological Institut [sic], ENVIRONMENTAL ASPECTS OF PVC (Copenhagen, Denmark: Danish Technological Institut, November 1995), pg. 91.

[20] See, for example, Danish Technical Institute, PVC AND ALTERNATIVE MATERIALS [Ministry of the Environment Report 18/1993] (Copenhagen: Ministry of the Environment, Danish Environmental Protection Agency [Strandgade 29, DK-1401 Copenhagen, Denmark], 1993.

[21] Conversation with Dan Rice, Midwest Sales Representative, McGaw, Inc., April 1997. Telephone: (800) 345-7744 ext. 4230 or 773-693-2170.

[22] Robert B. Wilson, SRI International, "The Impact of Metallocenes on PVC," unpublished paper presented at the World Vinyl Forum, September 1997. SRI International, 333 Ravenswood Avenue, Menlo Park, CA 94025. Telephone (650) 326-6200.

[23] Memorandum from Michael A. Babich, Ph.D., Chemist, Division of Health Sciences, U.S. Consumer Product Safety Commission, to Ronald L. Medford, Assistant Executive Director for Hazard Identification and Reduction, March 10 1998.

Descriptor terms: pvc; polyvinyl chloride; vinyl; plastics; carcinogens; di(2-ethylhexyl)phthalate; dehp; adipate; plasticizers; deha; food safety; consumer product safety commission; cpsc; toys; children; blood; phthalates; european union; eu; hazardous substances act; testicular cancer;