

Phthalates

WHAT ARE PHTHALATES?

Phthalates are a group of industrial chemicals that add flexibility and resilience to many consumer products. Of particular concern are di-2-ethylhexyl (DEHP), benzylbutyl phthalate (BzBP), dibutyl phthalate (DBP), and very likely diethyl phthalate (DEP). DEHP and BzBP are primarily used as plasticizers in polyvinyl chloride (PVC)-based plastics, as well as other flexible plastics, and found in tablecloths, furniture, vinyl flooring, shower curtains, garden hoses, inflatable swimming pools, plastic clothing such as raincoats, children's toys, automobile upholstery and tops, medical tubing, and blood storage bags.^{1,2} DEP and DBP are used in non-plastic consumer items as fixatives, detergents, lubricating oils, and solvents and can be found in carpets, paints, glue, insect repellents, time release capsules, and personal care products such as soap, shampoo, hair spray, nail polish, deodorants, and fragrances.²⁻⁶

PHTHALATES IN OUR BODIES

In a nationwide assessment of the exposure of the U.S. population to phthalates, scientists from the Centers for Disease Control and Prevention (CDC) measured levels of urinary phthalate monoesters (breakdown products of phthalates) in 289 people and found phthalates at unexpectedly high levels in every person tested.^{7,8} According to this assessment, researchers determined that "from a public health perspective, these data provide evidence that phthalate

exposure is both higher and more common than previously suspected."⁷ Though not representative of the population due to the small sample size, this study found that women of reproductive age (20 to 40 years) had substantially higher levels of DBP than the rest of the study group.⁷

In the 2005 CDC study, phthalates were once again widely detected in human urine samples with an increased sample size of over 2,500 Americans.³ Overall, the study indicated that, with the exception of MEP (mono-ethyl phthalate, the urinary metabolite of DEP), children age 6 to 11 years of age excreted higher concentrations of phthalate metabolites than the older age groups.¹ In the same report, researchers found that women had higher levels of MEP, MBP (mono-butyl phthalate, a urinary metabolite of DBP), MBzP (mono-benzyl phthalate, the urinary metabolite of BzBP), and three urinary metabolites of DEHP: MEHP (mono-2-ethylhexyl phthalate), MEOHP (mono-(2-ethyl-5-oxohexyl) phthalate), and MEHHP (mono-(2ethyl-5-hydroxyhexyl) phthalate).¹

In a more recent study, the phthalate monoesters MEHHP, MEOHP, and MEP were found to be present in 100% of 90 girls age 6 to 9, and MBP, MBzP, and MEHP were found in over 94%.¹⁰

HOW ARE WE EXPOSED TO PHTHALATES?

There are multiple human exposure routes for phthalates including oral, inhalation, ingestion, dermal, and intravenous—through transfusions and other medical devices and procedures.^{1,2,5,6,8} Phthalates are easily released from the plastic products in which they are used as they are not part of the polymer chain which forms the plastic.⁶



People are exposed to phthalates through direct contact with consumer products containing

phthalates, consumption of contaminated water or food (as the phthalates in plastic packaging may leach into the food they hold), inhalation of contaminated air, and during the manufacturing and disposal of products containing phthalates.^{2,6,11}

Individual phthalates have various routes of exposure:

- The largest source of DEHP exposure for the general population is diet, followed by inhalation of contaminated indoor air.¹¹ Exposures in food result from DEHP accumulating in foods and from the leaching of DEHP while processing, packaging, and storing.¹¹ The single largest use of DEHP is as a plasticizer for poly-vinyl chloride plastic (PVC). DEHP can leach from PVC under certain circumstances, causing direct human exposures.^{3,4,10}
- DEP exposure results mainly from direct use consumer products containing fragrances and personal care products such as shampoos, scents, soap, lotions, and cosmetics, and from inhalation of air containing these chemicals.^{3,10} Exposure to DEP

is also found in products such as toothbrushes, tools, food packaging, insecticides, and aspirin.⁶

- Exposure to DBP has been linked most commonly to cosmetics, mainly nail polish, but DBP is also found in pharmaceutical coatings, insecticides, and some printing inks.^{3,4,10}
- BzBP is an industrial solvent and found within adhesives, vinyl flooring, sealants, car-care products, and some personal care products such as hair spray.^{3,4,10}

WHAT DOES PHTHALATE EXPOSURE MEAN FOR OUR HEALTH?

Evidence that exposure to phthalates has possible adverse health effects has been building over recent years. Phthalate exposure has been linked to the following health concerns:

Reproductive and Developmental

Effects: Phthalate exposure can begin *in utero* and in one study is strongly associated with a shorter pregnancy duration.¹² Another study also found that prenatal phthalate exposure at environmental levels is associated with altered male reproductive development in humans, including shortened anogenital distance (signifying feminization), an increased likelihood of testicular maldescent, small and indistinct scrotum, and smaller penile size.¹³ Later research documented altered male reproductive hormone levels in baby boys most highly exposed to phthalates in their mother's breast milk.¹⁴ Phthalate exposure has also been linked to lower sperm counts, reduced sperm motility, and damaged sperm in men.¹⁵

Respiratory System:

Studies have shown concentrations of phthalates in house dust are associated with asthma and rhinitis in children.¹⁶ Exposure to PVC flooring containing

phthalates has also been linked to increased bronchial obstruction during the first two years.⁹ In adult men, exposure to certain phthalates has been linked to reduced lung capacity at magnitudes similar to those observed with tobacco smoke.¹⁷

Effects in Laboratory Animals:

Depending on the exposure level, exposure to DEHP resulted in observed effects on the pituitary, thyroid, thymus, ovaries, testes, lung, kidneys, liver, and blood.¹¹

REGULATIONS FOR PHTHALATES

In the United States, federal regulation of phthalates fall under the Toxic Substances Control Act which was passed in 1976 and

has not been updated since.¹⁸ Though phthalates are considered a hazardous waste and are regulated as pollutants when released into the environment in the U.S., they remain basically unregulated in consumer products.^{18,19} Several states have tried and failed to pass laws banning phthalates in certain consumer products. However, in September, 2007 the California State Senate successfully passed a bill that would ban 6 phthalates in children's toys beginning in 2009.²⁰ On the global level, the European Union banned the use of six phthalates in children's toys and products in 2005, and prior to that, fourteen countries had restricted or banned their use.²¹

REDUCING YOUR EXPOSURE

Scientific evidence indicates that phthalates readily exit our bodies through urinary metabolites. Although people are continually exposed to phthalates because they are ubiquitous, you can minimize re-exposure to phthalates by:

Avoid products containing PVC plastic:

- Avoid the use of PVC/vinyl in building and home remodeling. Use safe alternatives such as those recommended by the Healthy Building Network (www.healthybuilding.net).
- Purchase natural fibers, polyester, or nylon shower curtains instead of vinyl.
- Avoid plastics marked with the #3 symbol; these are likely to contain PVC.
- Check with your children's toy manufactures to see if they have pledged to stop using PVC. Toymakers Brio, Chicco, Early Start, Evenflo, Gerber, Lego, Prime Time, Sassy, and Tiny Love have already made the commitment.

Awareness of Household Products:

- Educate yourself as to whether the adhesives, caulk, grout, and sealants you use contain phthalates. In the National Institutes of Health's Household Products Database, you can search for phthalate as an ingredient. It can be found at www.householdproducts.nlm.nih.gov.

Phthalate-free Personal Care Products:

- Look at ingredient lists and avoid products listing "fragrance" or phthalates.
- Choose products from companies that have signed the Compact for Safe Cosmetics. For a listing, check out: www.safecosmetics.org.
- Research the ingredients of your personal care products, beyond what is on the ingredient label. Check out the Skin Deep Database at www.ewg.org/reports/skindeep2/index.php for a more complete listing.

Know What Is In Your Food:

- Grow and harvest your own food without using pesticides, or purchase organic foods if possible.

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