

PHTHALATE TOXICITY- OUR HEALTH AT GREAT RISK

PHTHALATE is use as Plasticizer-
substances added to plastics to increase
their flexibility, transparency, durability,
and longevity

- Traces of these compounds can leach out of the product. Owing to concerns over the effects of such leachates, the [European Union](#) has restricted the use of [DEHP](#) (di-2-ethylhexyl phthalate) and other phthalates in some applications. Some compounds leaching from polystyrene food containers have been proposed to interfere with hormone functions and are suspected human carcinogens.^[24] Other chemicals of potential concern include [alkylphenols](#).^[3]

- Pure plastics have low toxicity due to their insolubility in water and because they are biochemically inert, due to a large molecular weight. Plastic products contain a variety of additives, some of which can be toxic. For example, [plasticizers](#) like [adipates](#) and [phthalates](#) are often added to brittle plastics like polyvinyl chloride to make them pliable enough for use in food packaging, [toys](#), and many other items

- According to *in vivo* and observational studies by Davis *et al.* (1994) and Lopez-Carillo *et al.* (2010), there is an association between phthalate exposure and endocrine disruption leading to development of breast cancer.

- Whereas the finished plastic may be non-toxic, the monomers used in the manufacture of the parent polymers may be toxic. In some cases, small amounts of those chemicals can remain trapped in the product unless suitable processing is employed. For example, the [World Health Organization's International Agency for Research on Cancer](#) (IARC) has recognized [vinyl chloride](#), the precursor to PVC, as a human [carcinogen](#).^[24]

Dimethyl phthalate	DMP	$C_6H_4(COOCH_3)_2$	194.18
Diethyl phthalate	DEP	$C_6H_4(COOC_2H_5)_2$	222.24
Diallyl phthalate	DAP	$C_6H_4(COOCH_2CH=CH_2)_2$	246.26
Di-n-propyl phthalate	DPP	$C_6H_4[COO(CH_2)_2CH_3]_2$	250.29
Di-n-butyl phthalate	DBP	$C_6H_4[COO(CH_2)_3CH_3]_2$	278.34
Diisobutyl phthalate	DIBP	$C_6H_4[COOCH_2CH(CH_3)_2]_2$	278.34
Butyl cyclohexyl phthalate	BCP	$CH_3(CH_2)_3OCC_6H_4COOC_6H_{11}$	304.38
Di-n-pentyl phthalate	DNPP	$C_6H_4[COO(CH_2)_4CH_3]_2$	306.40

Dicyclohexyl phthalate	DCP	$C_6H_4[COOC_6H_{11}]_2$	330.42
Butyl benzyl phthalate	BBP	$CH_3(CH_2)_3OOC C_6H_4COOCH_2C_6H_5$	312.36
Di-n-hexyl phthalate	DNHP	$C_6H_4[COO(CH_2)_5CH_3]_2$	334.45
Diisohexyl phthalate	DIHxP	$C_6H_4[COO(CH_2)_3CH(CH_3)_2]_2$	334.45
Diisoheptyl phthalate	DIHpP	$C_6H_4[COO(CH_2)_4CH(CH_3)_2]_2$	362.50
Butyl decyl phthalate	BDP	$CH_3(CH_2)_3OOC C_6H_4COO(CH_2)_9CH_3$	362.50
Di(2-ethylhexyl) phthalate	DEHP, DOP	$C_6H_4[COOCH_2CH(C_2H_5)(CH_2)_3CH_3]_2$	390.56
Di(n-octyl) phthalate	DNOP	$C_6H_4[COO(CH_2)_7CH_3]_2$	390.56
Diisooctyl phthalate	DIOP	$C_6H_4[COO(CH_2)_5CH(CH_3)_2]_2$	390.56
n-Octyl n-decyl phthalate	ODP	$CH_3(CH_2)_7OOC C_6H_4COO(CH_2)_9CH_3$	418.61

Diisononyl phthalate	DINP	$C_6H_4[COO(CH_2)_6CH(CH_3)_2]_2$	418.61
Di(2- propylheptyl) phthalate	DPHP	$C_6H_4[COOCH_2CH(CH_2CH_2CH_3)(CH_2)_4CH_3]_2$	446.66
Diisodecyl phthalate	DIDP	$C_6H_4[COO(CH_2)_7CH(CH_3)_2]_2$	446.66
Diundecyl phthalate	DUP	$C_6H_4[COO(CH_2)_{10}CH_3]_2$	474.72
Diisoundecyl phthalate	DIUP	$C_6H_4[COO(CH_2)_8CH(CH_3)_2]_2$	474.72
Ditridecyl phthalate	DTDP	$C_6H_4[COO(CH_2)_{12}CH_3]_2$	530.82
Diisotridecyl phthalate	DIUP	$C_6H_4[COO(CH_2)_{10}CH(CH_3)_2]_2$	530.82

- Plasticizers for plastics are additives, most commonly [phthalate](#) esters in PVC applications. Almost 90% of the market for plasticizer is for [PVC](#), giving this material improved flexibility and durability(ACC,2009).Plasticizers work by embedding themselves between the chains of [polymers](#), spacing them apart (increasing the "free volume"), and thus significantly lowering the [glass transition](#) temperature for the plastic and making it softer. For plastics such as PVC, the more plasticizer added, the lower its cold flex temperature will be. This means that it will be more flexible and its durability will increase as a result of it. Plasticizers evaporate and tend to concentrate in an enclosed space; the "[new car smell](#)" is caused mostly by plasticizers evaporating from the car interior.

- Phthalates are used in a large variety of products, from enteric coatings of pharmaceutical tablets and nutritional supplements to viscosity control agents, gelling agents, film formers, stabilizers, dispersants, lubricants, binders, emulsifying agents, and suspending agents. End-applications include adhesives and glues, electronics, agricultural adjuvants, building materials, personal-care products, medical devices, detergents and surfactants, packaging, children's toys, modeling clay, waxes, paints, printing inks and coatings, pharmaceuticals, food products, and textiles.

- Globally, approximately six million tonnes of plasticizers are consumed every year, of which European consumption accounts for approximately 1 million tonnes. They contribute 10-60% of plastic products by weight (Rudel & Perovich 2008). More recently in Europe, regulatory developments have resulted in a change in phthalate consumption, with the higher phthalates (DINP and DIDP) replacing DEHP as the plasticizer of choice because DIDP and DIP are not classified as hazardous. DEHP, although most applications are shown to pose no risk when studied using recognized methods of risk assessment, has been classified as a Category 1A reprotoxin and is now on the Annex XIV of the European Union's [REACH](#) legislation which means that producers and users will need to submit authorization requests to the [European Chemicals Agency](#) in Helsinki to continue to use DEHP. Analysis of such applications will involve studies on alternatives and, given the wide number of compounds that have been used as plasticizers, such evaluations are likely to be far reaching.

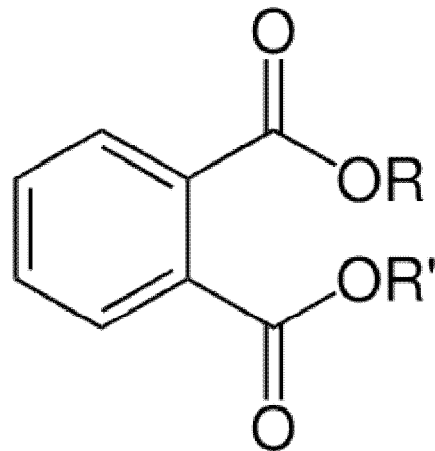
- Phthalates are easily released into the environment because there is no [covalent bond](#) between the phthalates and [plastics](#) in which they are mixed. As plastics age and break down, the release of phthalates accelerates. People are commonly exposed to phthalates, and most Americans tested by the [Centers for Disease Control and Prevention](#) have [metabolites](#) of multiple phthalates in their urine. Because phthalate plasticizers are not chemically bound to PVC, they can easily leach and evaporate into food or the atmosphere.

- Phthalate exposure can be through direct use or by indirect means through leaching and general environmental contamination. [Diet](#) is believed to be the main source of di(2-ethylhexyl) phthalate (DEHP) and other phthalates in the general population. Fatty foods such as milk, butter, and meats are a major source.
- Phthalates are used in a large variety of products, from [enteric coatings](#) of pharmaceutical pills and nutritional supplements to [viscosity](#) control agents, gelling agents, film formers, [stabilizers](#), [dispersants](#), [lubricants](#), binders, [emulsifying agents](#), and suspending agents. "

- End-applications include adhesives and glues, [agricultural adjuvants](#), building materials, personal-care products, medical devices, detergents and [surfactants](#), packaging, children's toys, [modelling clay](#), waxes, [paints](#), printing inks and coatings, pharmaceuticals, food products, and textiles. Phthalates are also frequently used in soft plastic fishing lures, [caulk](#), [paint](#) pigments, and [sex toys](#) made of so-called "jelly rubber". Phthalates are used in a variety of household applications such as shower curtains, vinyl upholstery, adhesives, floor tiles, food containers and wrappers, and cleaning materials. Personal-care items containing phthalates include perfume, eye shadow, moisturizer, nail polish, liquid soap, and hair spray(Rudel &Perovich ,2008).

- They are also found in modern electronics and medical applications such as catheters and blood transfusion devices. The most widely used phthalates are the [di\(2-ethylhexyl\) phthalate](#) (DEHP), the [diisodecyl phthalate](#) (DIDP), and the [diisononyl phthalate](#) (DINP). DEHP is the dominant plasticizer used in [PVC](#) due to its low cost. [Benzylbutylphthalate](#) (BBP) is used in the manufacture of foamed PVC, which is mostly used as a flooring material. Phthalates with small R and R' groups are used as [solvents](#) in [perfumes](#) and [pesticides](#).

- **Identification in plastics**
- Some type 3 plastics may leach phthalates.



- Phthalates are used in some but not all [PVC](#) formulations, and there are no specific labeling requirements for phthalates. PVC plastics are typically used for various containers and hard packaging, medical tubing, and bags, and are labelled "Type 3" for recycling reasons. However, the presence of phthalates rather than other plasticizers is not marked on PVC items. Only unplasticized PVC (uPVC), which is mainly used as a hard construction material, has no plasticizers. If a more accurate test is needed, chemical analysis, for example by [gas chromatography](#) or [liquid chromatography](#), can establish the presence of phthalates.

- [Polyethylene terephthalate](#) (PETE) is the main substance used to package [bottled water](#) and many sodas. Products containing PETE are labeled "Type 1" (with a "1" in the recycle triangle) for recycling purposes. Although the word "phthalate" appears in the name, PETE does not use phthalates as plasticizers. The terephthalate polymer PETE and the phthalate ester plasticizers are chemically different substances (Plasticsmythbuster, 2013). Despite this, however, a number of studies have found phthalates such as DEHP in bottled water and soda (USA, 2013). One hypothesis is that these may have been introduced during plastics recycling. Several studies tested the liquids before they were bottled, in order to make sure the phthalates came from the bottles rather than already being in the water.

- In a 2008 Bulgarian study, higher dust concentrations of DEHP were found in homes of children with asthma and allergies, compared with healthy children's homes (Kolarik et al. 2008). The author of the study stated, "The concentration of DEHP was found to be significantly associated with wheezing in the last 12 months as reported by the parents." (Kolarik et al. 2008). Phthalates were found in almost every sampled home in Bulgaria.

- The same study found that DEHP, BBzP, and DnOP were in significantly higher concentrations in dust samples collected in homes where polishing agents were used. Data on flooring materials was collected, but there was not a significant difference in concentrations between homes where no polish was used that have balatum (PVC or linoleum) flooring and homes with wood. High frequency of dusting did decrease the concentration. [\[8\]](#)

- In 2008, the Danish Environmental Protection Agency (EPA) found a variety of phthalates in [erasers](#) and warned of health risks when children regularly suck and chew on them. The European Commission [Scientific Committee on Health and Environmental Risks](#) (SCHER), however, considers that, even in the case when children bite off pieces from erasers and swallow them, it is unlikely that this exposure leads to health consequences(Green Facts Website2009).

- Phthalates are also found in medications, where they are used as inactive ingredients in producing [enteric coatings](#). It is not known how many medications are made using phthalates, but some include [omeprazole](#), [didanosine](#), [mesalamine](#), and [theophylline](#). A recent study found that urinary concentrations of monobutyl phthalate, the DBP metabolite, of Asacol (a particular formulation of mesalamine) users was 50 times higher than the mean of nonusers(Hernández-Díaz 2009).
- The study showed that exposures from phthalate-containing medications can far exceed population levels from other sources(Hernández-Díaz 2009).
- DBP in medications raises concern about health risks due to the high level of exposures associated with taking these medications, especially in vulnerable segments of the population, including pregnant women and children(Hernández-Díaz 2009).
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