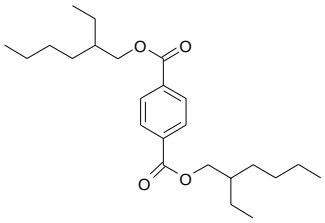
SIDS INITIAL ASSESSMENT PROFILE

CAS No.	6422-86-2
Chemical Name	Di(2-ethylhexyl)terephthalate (DEHT)
Structural Formula	

SUMMARY CONCLUSIONS OF THE SIAR

Human Health

Di(2-ethylhexyl)terephthalate (DEHT) has been shown in both *in vitro* and *in vivo* studies to have the potential to undergo complete hydrolysis to yield terephthalic acid and 2-ethylhexanol (2-EH), which are rapidly eliminated. Results of these metabolism studies also indicate DEHT was not well absorbed within the gastrointestinal tract, with 36% of it recovered in the feces still intact. In addition, a study to assess dermal absorption rate indicated that DEHT has a very low potential to penetrate the skin (0.103 $\mu g/cm^2/hr$), which further limits systemic exposure potential.

The acute oral LD_{50} values are in excess of 3,200 mg/kg in mice and 5,000 mg/kg in rats. The acute dermal LD_{50} value is in excess of 19,670 mg/kg bw in guinea pigs, and skin and eye irritation studies in animals and/or humans indicate that DEHT has only a slight potential to induce irritation. In studies with some limitations, no skin sensitization was observed in humans or animals.

In one repeated dose study, rats were fed diets containing up to 2.5% (approx. 2,000 mg/kg bw/day) DEHT for 21 days, while in the other they received up to 1% DEHT in the diet for 90 days (approx. 561 mg/kg bw/day for males and 617 mg/kg bw/day for females). The NOELs in both studies were 0.5 % (approximately 500 mg/kg bw/day in the 21 day study and 277 – 309 mg/kg bw/day in the 90 day study). The only effect noted at 1.0 % in the 90 day study was increased relative liver weight. In the 21-day study, administration of 1.0 % was associated with increased relative liver weight in females but was without effect in males. Peroxisome proliferation in the liver was not noted in animals treated with either of these dosing regimens.

DEHT has been shown to be negative in both mutagenicity and chromosomal aberration assays with and without metabolic activation. No carcinogenicity data are available.

The reproductive toxicity of DEHT has been assessed through a two-generation study in rats following OECD Test Guideline 416. The NOAEL for reproductive toxicity was 1.0% in the diet (500-700 mg/kg bw/day for males and 800-1000 mg/kg bw/day for females; highest dose tested), and the NOAEL for parental and offspring toxicity based on reduced body weight gains was 0.3% (150-200 mg/kg bw/day for males and 250-300 mg/kg bw/day for females). Mean maternal body weights and body weight gains were reduced for F0 and F1 females in the 1.0% group throughout pregnancy and decreased mean terminal body weights were noted in F1 males and females given 0.6% or 1.0% test material. The results of this study, in conjunction with the 90-day study described above which also showed no effect of DEHT on histology of reproductive organs indicate that DEHT has a low potential to induce reproductive toxicity.

Developmental toxicity was evaluated in a dietary study following OECD Test Guideline 414. The NOEL for maternal toxicity was 0.6% (458 mg/kg/day) and the NOEL for developmental toxicity was 1.0% (747 mg/kg/day; highest dose tested). The ability of DEHT to induce anti-androgenic like effects in male offspring was assessed by giving pregnant rats 750 mg/kg DEHT by gavage on gestation day 14 until postnatal day (PND) 3. No changes indicative of a feminization effect were induced in male pups. Results of a uterotrophic assay in which immature females were given up to 2000 mg/kg/day DEHT by gavage on PND 19-21 also indicate that DEHT does not possesses estrogenic activity.

Environment

DEHT is a high boiling liquid (boiling point 383°C at 1015 hPa) with a very low vapour pressure (estimated to be 2.85 E-5 hPa at 25°C by EPIWIN). It has a melting point of -48°C, a water solubility of 0.0004 mg/l and an EPIWIN-estimated octanol/water partition coefficient of 8.39. The atmospheric photodegradation half-life is 0.487 days (5.84 daylight hours). Based on its molecular structure, DEHT is not anticipated to undergo rapid hydrolysis in the presence of water. Level III fugacity modeling assuming equal distribution indicates 0.743% to air, and 7.26% to water with greater percentages in the soil and sediment compartments (28% and 64%, respectively). These results are supported by a Koc value of 1.62 E+5. While the vapour pressure of DEHT is very low, the Henry's Law Constant is relatively high (1.02 E-5 atm-m^3/mol) due to the substance's offsetting low aqueous solubility. A biodegradation study failed to show that the material was "readily biodegradable" under the method and conditions of the test, but did show 40.2% conversion to CO2 in 28 days indicating that the material is ultimately biodegradable. Results of an activated sludge respiration inhibition test indicate that DEHT is not toxic to wastewater microbes. Studies assessing acute and chronic toxicity to fish (Fathead minnow and Rainbow trout) and invertebrates (*Daphnia magna*, Planorbid snail, Eastern oyster), and acute affects on algal (*Selenastrum capricornutum*) growth showed no effects at water concentrations that were often significantly greater than its limit of solubility in distilled, deionized water that is free of particulate matter (0.0004 mg/L). Terrestrial plant growth in three species was not affected by DEHT exposure. An OECD sediment-water chironomid toxicity test using spiked sediments indicated that the EC50 was greater than the highest concentration recommended by the method (1000 mg/kg nominal, 950 mg/kg measured) and the NOEC was 180 mg/kg. A bioconcentration study in oysters indicated that the material has a medium to low potential to bioconcentrate (BCF = 393). However, due to its propensity to be eliminated by higher trophic organisms, it is not expected to bioaccumulate.

Exposure

A single U.S. manufacturer produces DEHT using a continuous reactor, distillation column and storage tanks. Annual production is about 25-50 thousand metric tons. Occupational exposure is limited by the closed process, and also because the substance is a high boiling liquid of limited volatility. The primary use of DEHT is as a plasticizer whereby it is bound in a polymer matrix, limiting consumer exposure. Some consumer exposure may occur based on a minor use in coated fabrics, but the application is on the exterior of the fabric, away from direct dermal contact, and the DEHT is bound up in the polymer. Concentrations of DEHT in the environment in air or water have not been reported, but there is limited potential for release into the environment. Environmental releases during manufacture and processing are limited by the use of enclosed processes and by in-plant treatment of any waste streams through biodegradative waste treatment or incineration. DEHT is released slowly into the environment from various uses of PVC, such as in PVC waterstops, gaskets, weather stripping, shoe soles, pond linings and wire coatings. Any DEHT that may enter the environment will have a strong tendency to be adsorbed onto solid matter such as soil and sediment.

RECOMMENDATION AND RATIONALE FOR THE RECOMMENDATION AND NATURE OF FURTHER WORK RECOMMENDED

The chemical is currently of low priority for further work because of its low hazard profile.