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Excerpt from: National Library of Medicine, TOXNET (Toxicology Data Network), Hazardous Substances Data Bank (HSDB). "bis(2-Ethylhexyl)phthalate." http://toxnet.nlm.nih.gov/, accessed June 11, 2007.

BIS(2-ETHYLHEXYL)PHTHALATE

CASRN: 117-81-7

Environmental Fate/Exposure Summary:

Bis(2-ethylhexyl)phthalate has been reported to be a possible natural product in animals and plants. Bis(2-ethylhexyl)phthalate has been found in floor tiles, various types of furnishings for households and transportation vehicles, food packaging systems, industrial tubing and conduits, medical tubing, catheters and blood containers, certain types of dental material, coatings for drugs, and numerous other products. Bis(2-ethylhexyl)phthalate's production and use as a plasticizer and as an insulating fluid in electrical transformers may result in its release to the environment through various waste streams. If released to air, a vapor pressure of 7.23X10-8 mm Hg suggests this compound will exist in both the vapor and particulate phases in the ambient atmosphere. Vapor-phase bis(2-ethylhexyl)phthalate will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 18 hours. Particulate-phase bis(2-ethylhexyl)phthalate will be physically removed from the atmosphere by wet and dry deposition. Half-lives for the reaction of gas-phase hydroxyl radicals with bis(2-ethylhexyl)phthalate adsorbed onto various aerosols were as follows, days: 1.1 on silicon dioxide; 1.2 on aluminum oxide; 1.3 on iron(III) oxide; and 2.0 on coal fly ash. After 14 hours irradiation with a 300 W xenon lamp, evolved carbon dioxide reached 0.5 to 0.7 mg/g bis(2-ethylhexyl)phthalate; 2-ethyl-1-hexene, 2-ethylhexanol, and phthalic acid were identified in the irradiated residue. If released to soil, measured Koc values ranging from 87,420 to 510,000 indicate bis(2-ethylhexyl)phthalate will be immobile. Volatilization is not expected to be an important process from wet or dry soil surfaces based upon an estimated Henry's Law constant of 1.3X10-7 atm-cu m/mole and this compound's measured vapor pressure, respectively. Biodegradation is expected to be an important process in both water and soil under aerobic conditions. Mineralization rates ranged from 50% after 20 days in Erie silt loam to 22 to 32% in three soils after 60 days. River die-away tests have reported half-lives of 2 to 3 weeks. It was biodegraded with a half-life of 60 to 70 hours in groundwater impacted by bis(2-ethylhexyl)phthalate, ethylbenzene, and xylenes. If released into water, measured soil/sediment Koc values ranging from 87,420 to 510,000 and suspended solid Koc values ranging from 22,000 to 1X10+6 indicate bis(2-ethylhexyl)phthalate will adsorb to suspended solids and sediment in the water column. Volatilization from water surfaces is not expected to occur based upon the estimated Henry's Law constant. Hydrolysis is not expected to be an important process based upon a half-life of 2000 years at pH 7. Measured BCFs of 115 and 851 in bluegill sunfish and fathead minnows indicate bioconcentration in aquatic organisms will be high. However, experiments with rainbow trout showed that the majority of (14)C-bis(2-ethylhexyl)phthalate did not reach the systemic circulation of the fish, but was present in the exposure water as metabolites as a result of presystemic branchial metabolism of this compound. Occupational exposure to bis(2-ethylhexyl)phthalate may occur through inhalation of aerosols and dermal contact with this compound at workplaces where bis(2-ethylhexyl)phthalate is produced or used. The general population may be exposed to bis(2-ethylhexyl)phthalate via inhalation of ambient air, ingestion of contaminated food and drinking water, and dermal contact with products containing this compound. (SRC)

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fathead minnows (Pimephales promelas)(7) and bluegill sunfish (Lepomis macrochirus)(8), respectively, suggest that bioconcentration in aquatic organisms is high(SRC). However, experiments with rainbow trout (Salmo gairdneri) showed that the majority of (14)C-bis(2-ethylhexyl)phthalate did not reach the systemic circulation of the fish, but was present in the exposure water as metabolites(9). A hydrolysis half-life of 2000 years at pH 7(2) suggests hydrolysis will not be an important environmental process(SRC). Biodegradation in aquatic systems is expected to be an important process under aerobic conditions(SRC). Acclimation is very important: in unacclimated systems no biodegradation was observed(10). River die-away tests have reported half-lives of 2 to 3 weeks(11-13). It was biodegraded with a half-life of 60 to 70 hours in groundwater impacted by bis(2-ethylhexyl)phthalate, ethylbenzene, and xylenes(14). Under anaerobic conditions in water/sediment mixtures, no biodegradation of bis(2-ethylhexyl)phthalate occurs(15,16).

[(1) Swann RL et al; Res Rev 85: 23 (1983) (2) Staples CA et al; Chemosphere 35: 667-715 (1997) (3) Lyman WJ et al; Handbook of Chemical Property Estimation Methods. Washington,DC: Amer Chem Soc pp. 4-9, 5-4, 5-10, 15-1 to 15-29 (1990) (4) Daubert TE, Danner RP; Physical and Thermodynamic Properties of Pure Chemicals: Data Compilation. Design Inst Phys Prop Data, Amer Inst Chem Eng., NY,NY: Hemisphere Pub Corp, Vol 5 (1996) (5) Yalkowsky SH, Dannenfelser RM; Aquasol Database of Aqueous Solubility. Ver 5. College of Pharmacy, Univ of Ariz - Tucson, AZ. PC Ver (1992) (6) Franke C et al; Chemosphere 29: 1501-14 (1994) (7) Veith G et al; J Fish Res Board Canada 36: 1040-8 (1979) (8) Barrows ME et al; Dyn Exp Hazard Assess Toxic Chem, Ann Arbor, MI: Ann Arbor Sci p 379-92 (1980) (9) Barron MG et al; Toxicol Appl Pharmacol 98: 49-57 (1989) (10) Tabak HH et al; J Water Pollut Contr Fed 53: 1503-18 (1981) (11) Wolfe NL et al; Environ Sci Technol 14: 1143-4 (1980) (12) Hattori Y et al; Pollut Control Cent Osaka Prefect Mizu Shori Gijutsu 16: 951-4 (1975) (13) Saeger VW, Tucker ES; Appl Environ Microbiol 31: 29-34 (1976) (14) Graves DA et al; Appl Biotechnol Site Remed, Hinchee RE et al eds, Lewis Publ: Ann Arbor, MI (1994) (15) Johnson BT, Lulves W; J Fish Res Board Can 32: 333-9 (1975) (16) Schwartz HE et al; Int J Environ Anal Chem 6: 133-44 (1979)]**PEER REVIEWED**

ATMOSPHERIC FATE: According to a model of gas/particle partitioning of semivolatile organic compounds in the atmosphere(1), **bis(2-ethylhexyl)phthalate,** which has a measured vapor pressure of 7.23X10-8 mm Hg at 25 deg C(2,SRC), will exist in both the vapor and particulate phases in the ambient atmosphere. Vapor-phase bis(2-ethylhexyl)phthalate is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals(SRC); the half-life for this reaction in air is estimated to be about 18 hours(3,SRC). Particulate-phase bis(2-ethylhexyl)phthalate may be physically removed from the air by wet and dry deposition(SRC). Bis(2-ethylhexyl)phthalate absorbs light in the environmental spectrum(4) indicating a potential for direct photolysis(SRC). Half-lives for the reaction of gas-phase hydroxyl radicals with bis(2-ethylhexyl)phthalate adsorbed onto various aerosols were as follows, days: 1.1 on silicon dioxide; 1.2 on aluminum oxide; 1.3 on iron(III) oxide; and 2.0 on coal fly ash(5,SRC).

[(1) Bidleman TF; Environ Sci Technol 22: 361-367 (1988) (2) Daubert TE, Danner RP; Physical and Thermodynamic Properties of Pure Chemicals: Data Compilation. Design Inst Phys Prop Data, Amer Inst Chem Eng., NY,NY: Hemisphere Pub Corp, Vol 5 (1996) (3) Meylan WM, Howard PH; Chemosphere 26: 2293-99 (1993) (4) Kawaguchi H; Chemosphere 28: 1489-93 (1994) (5) Behnke W et al; J Aerosol Sci 18: 849-52 (1987)]**PEER REVIEWED**

fallow fields were 54 and 21 days in silty sand and silty loam, respectively; in fields grown with barley, half-lives of bis(2-ethylhexyl) phthalate were 200 and 14 days in silty sand grown and in silty loam, respectively(1). In three soils, (14)C-bis(2-ethylhexyl) phthalate, 10 mg/kg, mineralization ranged from 22 to 32% (14)CO2 after 60 days incubation(2). When present in soil in some nonaqueous-phase liquids, bis(2-ethylhexyl) phthalate was not appreciably mineralized; <5% mineralization was observed after 15 days in Erie silt loam when dissolved in 2,2,4,4,6,8,8-heptamethylnonane, 50% mineralization was observed after 20 days in Erie silt loam with no added nonaqueous-phase liquids(3). Bis(2-ethylhexyl) phthalate was decomposed slowly in soil with amounts of 15 to 50% remaining after 80 days(4). The low rate and extent of mineralization of bis(2-ethylhexyl) phthalate in heptamethylnonane present in slurries of aquifer solids was increased by inoculation of acclimated microbial cultures(5).

[(1) Ruedel H et al; Sci Total Environ 132: 181-200 (1993) (2) Dorfler U et al; Ecotoxicol Environ Saf 34: 216-22 (1996) (3) Efroymson RA, Alexander M; Environ Toxicol Chem 13: 405-11 (1994) (4) Kirchmann H et al; Swedish J Agric Res 21: 107-13 (1991) (5) Labare MP, Alexander M; Environ Toxicol Chem 14: 257-65 (1995)]**PEER REVIEWED**

ANAEROBIC: Under anaerobic conditions in water/sediment mixtures, no biodegradation of **bis(2-ethylhexyl)phthalate** occurs(1,2). During anaerobic digestion of municipal sludge an overall removal of 83.3% was observed; 61% was removed in primary digestion, 58.5% of the bis(2-ethylhexyl)phthalate entering secondary digestion was degraded(3). In two anaerobic bioassays bis(2-ethylhexyl)phthalate was partially metabolized, but little mineralization was observed(4). Bis(2-ethylhexyl)phthalate was not degraded by any of the anaerobic microbial consortia collected from four distinct ecosystems including freshwater lake sediment, salt marsh sediment, anaerobic digester sludge, and anaerobic leachate from a lab-scale simulated landfill digester(5). Bis(2-ethylhexyl)phthalate at concentrations of 25, 50, 100, and 200 mg C/l reached 48, 26, 19, and 6% of its theoretical gas production, respectively, following lag periods of 24, 25, 28, and >60 days, respectively, in Reading sludge after 60 days incubation under anaerobic conditions(6). 26% degradation was observed during anaerobic digestion of sludge with a 30 day solids retention time(7). Bis(2-ethylhexyl)phthalate was persistent in experiments with batch anaerobic digestion of spiked sewage sludge at chemical concentration ranges of 0.5 to 10 mg/l(8).

[(1) Johnson BT, Lulves W; J Fish Res Board Can 32: 333-9 (1975) (2) Schwartz HE et al; Int J Environ Anal Chem 6: 133-44 (1979) (3) Parker WJ et al; Water Res 28: 1779-89 (1994) (4) O'Connor OA et al; Environ Toxicol Chem 8: 569-76 (1989) (5) Painter SE, Jones WJ; Environ Technol 11: 1015-26 (1990) (6) Battersby NS, Wilson V; Chemosphere 17: 2441-60 (1988) (7) Govind R et al; Water Res 25: 547-56 (1991) (8) Ziogou K et al; Wat Res 23: 743-8 (1989)]**PEER REVIEWED**

Environmental Abiotic Degradation:

The rate constant for the vapor-phase reaction of **bis(2-ethylhexyl)phthalate** with photochemically-produced hydroxyl radicals has been estimated as 2.2X10-11 cu cm/molecule-sec at 25 deg C(SRC) using a structure estimation method(1,SRC). This corresponds to an atmospheric half-life of about 18 hours at an atmospheric concentration of 5X10+5 hydroxyl radicals per cu cm(1,SRC). An aqueous hydrolysis half-life of 2000 years was determined at pH 7(2). Rate constants for the reaction of gas-phase hydroxyl radicals with bis(2-ethylhexyl)phthalate adsorbed onto various aerosols were as follows, cu cm/s: 1.36X10-11 on silicon dioxide; 1.4X10-11 on aluminum oxide; 1.28X10-11 on iron(III) oxide; and 0.8X10-11

C24-H38-O4
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Molecular Weight:
390.56
[Budavari, S. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 1996., p. 210]**PEER REVIEWED**

Octanol/Water Partition Coefficient:
log Kow= 7.60
[Debruijin J et al; J Environ Toxicol Chem 8: 499-512 (1989)]**QC REVIEWED**

Solubilities:
LESS THAN 0.01% IN WATER @ 25 DEG C
[Lefaux, R. Practical Toxicology of Plastics. Cleveland: CRC Press Inc., 1968., p. 265]**PEER REVIEWED**

Soluble in blood and fluids containing lipoproteins
[Gosselin, R.E., R.P. Smith, H.C. Hodge. Clinical Toxicology of Commercial Products. 5th ed. Baltimore: Williams and Wilkins, 1984., p. II-204]**PEER REVIEWED**

MISCIBLE WITH MINERAL OIL & HEXANE
[American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values and Biological Exposure Indices. 5th ed. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1986., p. 223]**PEER REVIEWED**

In water, 0.285 mg/l at 24 deg C.
[Yalkowsky SH, Dannenfelser RM; Aquasol Database of Aqueous Solubility. Version 5. College of Pharmacy, Univ of Ariz - Tucson, AZ. PC Version (1992)]**PEER REVIEWED**

Slightly soluble in carbon tetrachloride.
[Lide, D.R. (ed.). CRC Handbook of Chemistry and Physics. 76th ed. Boca Raton, FL: CRC Press Inc., 1995-1996., p. 3-38]**PEER REVIEWED**

Major Uses:
For Bis(2-ethylhexylphthalate) (USEPA/OPP Pesticide Code: 295200) there are 0 labels match. /SRP: Not registered for current use in the U.S., but approved pesticide uses may change periodically and so federal, state and local authorities must be consulted for currently approved uses./
[U.S. Environmental Protection Agency/Office of Pesticide Program's Chemical Ingredients Database on Bis(2-ethylhexylphthalate) (117-81-7). Available from the Database Query page at http://www.cdpr.ca.gov/docs/epa/epamenu.htm as of October 24, 2002.]**QC REVIEWED**

The active ingredient is no longer contained in any registered pesticide products ... "cancelled."
[USEPA/OPP; Status of Pesticides in Registration, Reregistration and Special Review p.270 (Spring, 1998) EPA 738-R-98-002]**QC REVIEWED**

Photographic film, wire and cable, adhesives
[Nat'l Research Council Canada; Phthalate Esters in the Aquatic Environment p.49 (1980) NRCC No 17583]**PEER REVIEWED**

As plasticizer in flexible vinyl products. As a replacement for PCBs in dielectric fluids for elctric capacitors.
[Budavari, S. (ed.). The Merck Index - An Encyclopedia of Chemicals, Drugs, and Biologicals. Whitehouse Station, NJ: Merck and Co., Inc., 1996., p. 210]**PEER REVIEWED**

Plasticizer (polyvinyl chloride, rubber, adhesives, PVA emulsion paints, lacquers); non-reactive epoxy resin diluent.
[Ashford, R.D. Ashford's Dictionary of Industrial Chemicals. London, England: Wavelength Publications Ltd., 1994., p. 304]**PEER REVIEWED**

Plasticizer; also used as an insulating fluid in electrical transformers and pressure-sensitive printing.
[U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health. NIOSH Manual of Analytical Methods. 4th ed. Methods A-Z & Supplements. Washington, DC: U.S. Government Printing Office, Aug 1994., p. V9 803]**PEER REVIEWED**