

Technical Factsheet on: DI (2-ETHYLHEXYL) ADIPATE

[List of Contaminants](#)

As part of the Drinking Water and Health pages, this fact sheet is part of a larger publication:
National Primary Drinking Water Regulations

Drinking Water Standards

MCLG: 0.4 mg/L

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HAL(child): 1 day: 20 mg/L; Longer-term: 20 mg/L

Health Effects Summary

Acute: EPA has no data on the acute toxicity of di (2-ethylhexyl) adipate, or DEHA, which is relevant to the drinking water context. Drinking water levels which are considered "safe" for short-term exposures for a 10-kg (22 lb.) child consuming 1 liter of water per day: upto a 7-year exposure to 20 mg/L.

Chronic: DEHA has the potential to cause the following health effects from long-term exposures at levels above the MCL: reduced body weight and bone mass; damage to liver and testes.

Cancer: There is some evidence that DEHA may have the potential to cause cancer from a lifetime exposure at levels above the MCL.

Usage Patterns

Adipate is used primarily as a plasticizer, commonly blended with general purpose plasticizers in processing polyvinyl and other polymers. It is also used as a solvent; in aircraft lubricants; as a hydraulic fluid; as a plasticizer or solvent in the following cosmetics: bath oils, eye shadow, cologne, foundations, rouge, blusher, nail-polish remover, moisturizers and indoor tanning preparations; in meat wrapping operations. Production of adipates in 1984 was 27.5 million pounds.

Release Patterns

Sources of adipates include fly ash from municipal waste incineration, wastewater effluents from publicly-owned treatment works (POTW) and chemical manufacturing plants. Adipates are also used as a plasticizer in PVC materials and is known to leach from plumbing made of PVC plastic. Thus, adipates have been recognized as a potential drinking water contaminant.

From 1987 to 1993, according to EPA's Toxic Chemical Release Inventory, adipate releases to land and water totalled over 450,000 lbs., of which about 94 percent was to land. These releases were primarily from gray and ductile iron foundries. The largest releases occurred in Ohio and Indiana. The largest direct releases to water occurred in Tennessee.

Environmental Fate

If released to air, di(2-ethylhexyl) adipate (DEHA) can exist in both vapor and particulate phases. The vapor phase will degrade relatively rapidly by reaction with photochemically produced hydroxyl radicals (estimated half-life of 16 hr). The particulate phase can be physically removed from air by wet and dry deposition.

If released to soil or water, adipate is expected to biodegrade; activated sludge screening tests have shown that adipate biodegrades readily, with a half-life of 2.7 days. Estimated Koc values of 5004-48,600 suggest that adipate will be relatively immobile in soil (and not leach) and should partition from the water column to sediment in the aquatic environment. Volatilization is expected to be very slow (half-life of 160 days) and not environmentally important; aqueous hydrolysis is not expected to be important except in very alkaline waters (pH 9 or higher).

Dioctyl adipate was not acutely toxic to algae and fish at or above its water solubility of 0.78 mg/l. It was acutely and chronically toxic to *Daphnia magna* at 480-850 and 24-52 ug/l, respectively. A comparison of the mean environmental water concentration of dioctyl adipate (<0.5 ug/L) with laboratory chronic toxicity values for *Daphnia magna* showed a safety margin of approximately 3 under present use and disposal patterns, dioctyl adipate presents a small hazard to the freshwater aquatic environment. A whole-fish BCF of 27 was observed for blue-gill fish was far less than an estimated BCF value in excess of 2700 calculated from a measured log Kow of >6.11; the difference is thought to be due to metabolism of adipate by the bluegill. This measured BCF indicates that bioaccumulation and persistence in fish is not important environmentally but may be important in aquatic organisms that are unable to metabolize adipate.

Occupational exposure can occur through dermal contact and inhalation. The general population can be exposed through consumption of foods stored in plastic films; DEHA is used as plasticizer in various food storage wraps and it has been shown to migrate into stored foods. Exposure via drinking water is also possible since DEHA is also used as a plasticizer in PVC materials and is known to leach from plumbing made of PVC plastic.

Chemical/ Physical Properties

CAS Number: 103-23-1

Color/ Form/Odor: Light colored, oily liquid with an aromatic odor

M.P.: -67.8 C B.P.: 214 C

Vapor Pressure: 8.5×10^{-7} mmHg at 25 C

Octanol/Water Partition (Kow): Log Kow = >6.11

Density/Spec. Grav.: 0.922 at 25 C

Solubility: 0.78 g/L of water at 22 C; Slightly soluble in water

Soil sorption coefficient: Koc estimated at 5004 to 48,000; immobile in soil

Odor/Taste Thresholds: N/A

Bioconcentration Factor: BCF = 27 in fish; not expected to bioconcentrate in aquatic organisms.

Henry's Law Coefficient: 4.34×10^{-7} atm-cu m/mole at 20 C;

Trade Names/Synonyms: Adipic acid, bis(2-ethylhexyl) ester; Bis(2-ethylhexyl) hexanedioate; BEHA; DEHA; Adipol 2EH; Bisoflex DOA; Dioctyl adipate; Effomoll DOA; Flexol A26; Kodflex DOA; Monoplex DOA; Octyl adipate; Plastomoll DOA; Sicol 250; Truflex DOA; Vestinol OA; Wickenol 158; Witamol 320; Ergoplast AdDO; Kemester 5652; Reomol DOA; Rucoflex plasticizer DOA; Staflex DOA. Adipate, (2-diethylhexyl)

Other Regulatory Information

Monitoring For Ground/Surface Water Sources:

Initial Frequency- 4 quarterly samples every 3 years
Repeat Frequency- If no detections during initial round:
 2 quarterly per year if serving >3300 persons;
 1 sample per 3 years for smaller systems
Triggers - Return to Initial Freq. if detect at >0.0006 mg/L
 Analysis:

Reference Source Method Numbers

EPA 600/4-88-039 506; 525.2

Treatment- Best Available Technologies:
Granular Activated Charcoal

Toxic Release Inventory - Releases to Water and Land, 1987 to 1993 (in pounds):

| | Water | | Land |
|----------------------------|---------------|---------|----------------|
| TOTALS | 27,471 | | 425,230 |
| Top Five States* | | | |
| OH | 531 | 173,900 | |
| IN | 5,500 | 93,275 | |
| VA | 1,886 | 46,102 | |
| TN | 18,480 | 26,409 | |
| MI | 250 | 29,750 | |
| Major Industries* | | | |
| Gray iron foundries | | 2,263 | 316,438 |
| Aluminum foundries | | 250 | 50,409 |
| Rubber, plastic hose/belts | | 10 | 32,078 |
| Space propulsion units | | 0 | 20,363 |
| Misc Indust. organics | | 11,996 | 131 |

* Water/Land totals only include facilities with releases greater than a certain amount - usually 1000 to 10,000 lbs.

For Additional Information:

EPA can provide further regulatory and other general information:
EPA Safe Drinking Water Hotline - 800/426-4791

Other sources of toxicological and environmental fate data include:
Toxic Substance Control Act Information Line - 202/554-1404
Toxics Release Inventory, National Library of Medicine - 301/496-6531
Agency for Toxic Substances and Disease Registry - 404/639-6000