

Sources of Exposure

Toxicokinetics and Normal Human Levels

Biomarkers/Environmental Levels

ToxGuide™

for

Di(2-ethylhexyl)phthalate



CAS# 117-81-7

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U.S. Department of Health and Human Services
Public Health Service
Agency for Toxic Substances and Disease Registry
www.atsdr.cdc.gov

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General Populations

- The predominant routes of exposure to di(2-ethylhexyl)phthalate (DEHP) for the general population are inhalation of contaminated indoor air, ingestion of contaminated water and exposure during medical procedures from plastic medical products.
- Consumer products containing DEHP include wall coverings, tablecloths, floor tiles, furniture upholstery, shower curtains, garden hoses, swimming pool liners, rainwear, baby pants, dolls, some toys, shoes, automobile upholstery, packaging film, sheathing for wires, medical tubing and blood storage bags.
- As a result of concern for potential health effects associated with DEHP, many manufacturers have discontinued its use in their products.
- Medical exposures are likely to be greater than environmental exposures.
- Exposure may also occur through dermal contact with plastic clothing such as raincoats.

Occupational Populations

- Workers may be exposed to high concentrations of DEHP during the compounding of this plasticizer with resins and the manufacture of PVC plastic products.

Toxicokinetics

- Approximately 55% of ingested DEHP is absorbed. DEHP is poorly absorbed through the skin. There are no quantitative absorption data for the inhalation route.
- Following ingestion, DEHP is rapidly broken down in the gut to mono(2-ethylhexyl)phthalate and 2-ethylhexanol.
- DEHP is lipophilic and tends to accumulate in adipose tissues.
- DEHP and its derivatives are predominately excreted in the urine. Approximately 20–25% of absorbed DEHP is excreted in the feces.

Normal Human Levels

- The average total daily ambient exposure in the U.S. population as indicated in urine samples is <3.6 µg/kg body weight/day.

Biomarkers

- DEHP and its metabolites in the blood and urine can be used as biomarkers of exposure.

Environmental Levels

Air

- Mean concentration in air at 6 sites was 0.061 µg/m³. Median concentration in dust was 315 µg/g.

Sediment and Soil

- Median concentration in stream bed sediments is 180 µg/kg.

Water

- Concentrations in surface water range from 0.6 to 2,400 ppb. Concentrations in groundwater from private wells near landfills and factories range from 0.04–420 ppb.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for Di(2-ethylhexyl)phthalate. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.



Chemical and Physical Information

Routes of Exposure

Relevance to Public Health (Health Effects)

DEHP is a Liquid

- DEHP is a colorless liquid with almost no odor that evaporates easily. It is manufactured and is not found in the environment naturally.
- DEHP is commonly added to plastics to make them flexible. 95% of DEHP produced is used as a plasticizer for PVC.
- DEHP is a widely used chemical that enters the environment both through disposal of industrial and municipal wastes in landfills and by leaching into consumer products stored in plastics.

- Inhalation – Minor route of exposure for general population. Predominant route of occupational exposure.
- Oral – Major route of exposure for general population via ingestion of food.
- Dermal – Minor route of exposure for general population.

DEHP in the Environment

- DEHP attaches strongly to soil and does not move far from where it was released. It dissolves very slowly in water and may take years before disappearing from buried or discarded materials.
- In the presence of oxygen, DEHP can be broken down by microorganisms to carbon dioxide and other chemicals.
- Very little DEHP is evaporated into air. Once in the air; it will bind to dust particles and will be returned to the ground through rain and snow.
- DEHP bioconcentrates in aquatic organisms. Rapid metabolism in higher organisms prevents biomagnifications in the food chain.

Health effects are determined by the dose (how much), the duration (how long), and the route of exposure.

Minimal Risk Levels (MRLs)

Inhalation

- No acute-, intermediate, or chronic-duration inhalation MRLs were derived for DEHP.

Oral

- No MRL was derived for acute-duration oral exposure (≤ 14 days).
- An MRL of 0.1 mg/kg/day was derived for intermediate-duration oral exposure (15–364 days).
- An MRL of 0.06 mg/kg/day was derived for chronic-duration oral exposure (≥ 365 days).

Health Effects

- The main targets of DEHP toxicity in oral animal studies are the liver and testes. Toxic effects include loss of spermatogenesis, decreased fertility and hepatocarcinoma.
- Studies in rats suggest that gestational exposure to DEHP impairs the development of the reproductive system in male offspring.
- Data on oral toxicity in humans is limited to gastrointestinal symptoms.
- In animal studies, inhalation of DEHP did not result in serious harmful effects.
- DHHS has determined that DEHP may reasonably be anticipated to be a human carcinogen. IARC has determined that DEHP cannot be classified as to its carcinogenicity to humans.

Children's Health

- It is unknown if susceptibility of health effects from DEHP differs from adults.
- Animal studies suggest that young males are more susceptible than adults to adverse effects on the sex organs.