



Di (2-ethylhexyl) phthalate (DEHP)

What is di (2-ethylhexyl) phthalate?

- DEHP is a colorless liquid with almost no odor; and it evaporates easily.
- DEHP is a manufactured chemical and does not occur naturally.

What are the uses of di (2-ethylhexyl) phthalate?

- DEHP is commonly added to plastics to make them flexible.
- DEHP may be present in consumer products such as wall coverings, tablecloths, furniture upholstery, shower curtains, soaps, shampoo, lotions, garden hoses, swimming pool liners, rainwear, baby pants, dolls, shoes, automobile plastics, packaging film, wire sheathing, medical devices, medical tubing, blood storage bags, floor tiles and toys.
- DEHP may be a component of fluids injected underground to aid in the recovery of natural gas.

Is di (2-ethylhexyl) phthalate present in the environment?

- DEHP is widespread in the environment and is often found near industrial settings and at waste disposal landfills.
- DEHP enters the environment through releases from factories and household items.
- DEHP attaches strongly to soil and does not move far from where it was released.
- DEHP dissolves very slowly in surface water and groundwater.
- DEHP in streams, rivers, lakes and other surface waters is present at concentrations ranging from less than 0.002 to 137 parts per billion (ppb) with a mean concentration of 0.21 ppb.
- DEHP in groundwater is present at concentrations ranging from undetected to 470 ppb with a mean concentration of 15.7 ppb.
- DEHP in drinking water is present at concentrations ranging from 0.16 ppb to 170 ppb with a mean concentration of 0.55 ppb.
- Very little DEHP is present in air. Air concentrations of DEHP in cities and industrial areas average less than 2 parts per trillion (ppt).

- DEHP in air will bind with dust particles and be carried back to earth by gravity and rain or snow.
- Microorganisms break down DEHP in the environment to carbon dioxide and other chemicals when oxygen is present. When oxygen is not present, it takes many years before DEHP in buried or discarded materials disappears from the environment.
- DEHP can migrate into foods from plastic packaging or storage films.
- DEHP was found in cheese and milk at concentrations as high as 35 milligrams per kilogram (mg/kg) and 31.4 milligrams per liter (mg/L), respectively.

How are people exposed to di (2-ethylhexyl) phthalate?

- Workers may be exposed to high concentrations of DEHP during the manufacture of plastic products.
- People can be exposed to DEHP through inhalation of contaminated air, ingestion of contaminated food and water, and intravenously during the use of certain medical devices.
- DEHP is present throughout the diet and may be in infant formulas and baby foods.
- Adults are generally estimated to have daily exposures to DEHP ranging from 1 to 30 micrograms per kilogram ($\mu\text{g}/\text{kg}$) of body weight or 0.001 to 0.03 mg/kg.
- Neonates have estimated daily exposures as high as 22.6 mg/kg DEHP during blood transfusions.

How does di (2-ethylhexyl) phthalate enter and leave the body?

- Following ingestion, DEHP is rapidly broken down in the gut to mono (2-ethylhexyl) phthalate (MEHP) and 2-ethylhexanol and is absorbed into the body.
- DEHP can enter the blood directly during transfusion.
- Breakdown of DEHP in the bloodstream is much slower than in the gut.
- DEHP is poorly absorbed through the skin.
- The amount of DEHP that can enter the body through the lungs is not known.
- DEHP and its breakdown products are predominately excreted in the urine.
- Approximately 20 – 25 percent of absorbed DEHP is excreted in the feces.
- Most of the DEHP, MEHP and 2-ethylhexanol leave the body within 24 hours in the urine and feces.

How harmful is exposure to di (2-ethylhexyl) phthalate?

- Toxicity is not generally seen in healthy individuals with normal dietary intakes of DEHP. However, ingestion of large amounts of DEHP may stimulate bowel movements, and breathing DEHP in household dust may increase the risk of children developing asthma.

Can exposure to di (2-ethylhexyl) phthalate cause cancer?

- The United States Environmental Protection Agency (EPA) classifies DEHP as a probable human carcinogen based on it causing increased liver tumors in rats.
- The Department of Health and Human Services (DHHS) has determined that DEHP may reasonably be anticipated to be a human carcinogen.
- The International Agency for Research on Cancer (IARC) has stated that DEHP cannot be classified as to its carcinogenicity in humans.

Is there a medical test to show whether I've been exposed to di (2-ethylhexyl) phthalate?

- MEHP and other DEHP breakdown products can be measured in urine.
- Urine tests only provide a measure for recent DEHP exposure (less than 24 hours), since it is rapidly broken down and excreted from the body. Therefore, urine test results cannot be used to predict potential health effects.
- In males, urinary levels of MEHP range from 3.26 to 4.15 µg/L. In females, urinary levels of MEHP range from 2.93 to 3.51 µg/L. Both levels are thought to represent only one-tenth of the ingested DEHP dose within the previous 24 hours.

Are there recommendations to protect public health?

- The Environmental Protection Agency (EPA) has set an enforceable limit, the Maximum Contaminant Level (MCL), of 0.006 mg/L or 6.0 ppb for DEHP in drinking water.
- The Food and Drug Administration (FDA) allows 0.006 mg/L (6 ppb) of DEHP in bottled water.
- The Occupational Safety and Health Administration's (OSHA) Permissible Exposure Limit (PEL) for DEHP in air is 5.0 milligrams per cubic meter (mg/m³) averaged over an eight-hour work shift.
- The Occupational Safety and Health Administration's (OSHA) Short Term Exposure Limit (STEL) for DEHP in air is 10 mg/m³ averaged over 15 minutes.
- The National Institute for Occupational Safety and Health's (NIOSH) Immediately Dangerous to Life or Health (IDLH) limit is 5000 mg of DEHP/m³.

Where can I get more information?

For more information, contact:

The Pennsylvania Department of Health, Division of Environmental Health Epidemiology, P.O. Box 90, Harrisburg, Pennsylvania, 17108. Telephone number: 717-787-3350.

The Agency for Toxic Substances and Disease Registry (ATSDR), 4770 Buford Highway North East, Atlanta, Georgia 30341. Telephone number: 800-CDC-INFO (800-232-4636).

References

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- (4) World Health Organization (WHO), Di (2-ethylhexyl) phthalate in Drinking-water, Background document for development of WHO Guidelines for Drinking-water Quality, 2003.
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- (6) Phthalates, U.S. EPA, Toxicity and Exposure Assessment for Children's Health, TEACH Chemical Summary, searched online on October 12, 2012 at http://www.epa.gov/teach/chem_summ/phthalates_summary.pdf.
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