n-Hexane - ToxGuide[™]

CHEMICAL AND PHYSICAL INFORMATION

n-Hexane is a very volatile substance that is a constituent of the paraffin fraction of crude oil and natural gas. It is flammable, and the vapor may be an explosion hazard.

n-Hexane is both naturally occurring and anthropogenic hydrocarbon. It may be released from plants, forest fires, and volcanos. It is used as an industrial chemical and laboratory solvent. It is mainly used to extract edible oils from seed crops, such as soybeans, cottonseed, flax, rape seed, peanuts, safflower seed, and corn germ. *n*-Hexane is also used as a special purpose solvent and cleaning agent in several industries including textile manufacturing, shoe and leather making, and furniture manufacturing. It is also used in various glues, adhesives, and leather dressing preparations, especially those used in assembling shoes.

ENVIRONMENTAL FATE AND DETECTED LEVELS



Air: The average ambient air level of *n*-hexane in samples taken from 55 locations in the United States in 2023 was 0.99 ppbv.

In air, *n*-hexane is degraded primarily by reaction with free radicals and hydroxyl radicals, with an estimated half-life of 1.96 days.

CH3CH2CH2CH2CH2CH3



Water: There are limited data on levels of n-hexane in water or groundwater.

In water, *n*-hexane will primarily volatilize.



Sediment and Soil: There are limited data on levels of *n*-hexane in soil and sediment.

n-Hexane present near the soil surface will likely volatilize.



Bioconcentration: An estimated bioconcentration factor (BCF) of 174 and an estimated bioaccumulation factor (BAF) of 307 suggest a low potential for *n*-hexane to bioconcentrate or bioaccumulate in trophic food chains.

GENERAL POPULATION EXPOSURE

General population exposure to *n*-hexane is expected to be low.

Primary route of potential exposure: Inhalation

• Inhalation exposure of vapors and emissions from refined petroleum products are the primary sources of *n*-hexane exposure to the general population.

Possible route[s] of potential exposure: Oral

n-Hexane is used to extract edible oils and proteins from plant seeds; the general population may be exposed to the *n*-hexane residues in these products.



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POPULATIONS WITH POTENTIALLY HIGH EXPOSURE

Workers at facilities that manufacture or use solvents and adhesives containing *n*-hexane or workers exposed to heating or motor fuels may be exposed via:

- inhalation of *n*-hexane vapors
- dermal deposition of *n*-hexane vapors

Compared to the general population, the following groups may also have increased risk of exposure:

- Populations living near industrial releases or contaminated hazardous waste sites (via ambient air and/or groundwater contamination).
- Populations near fuel storage tanks, fuel refineries, or underground storage tanks (e.g., at gas stations) (via contaminated sediments or groundwater).

BIOMARKERS

Primary: Levels of *n*-hexane and its primary metabolite, 2,5-hexanedione, can be measured in urine and blood. Because *n*-hexane and its metabolites are cleared from the body in a few days, these levels are only biomarkers of recent exposure.

BIOMONITORING LEVELS

n-Hexane blood levels have been measured in NHANES samples beginning in 2009–2010; however, the levels were below the detection limit of 0.122 ng/mL.

Animal studies suggest that serum, urine, and hair pyrrole adduct levels can be used as a biomarker of *n*-hexane exposure and *n*-hexane-induced peripheral neuropathy.

TOXICOKINETICS

Absorption: *n*-Hexane is readily absorbed in the lungs. Absorption by oral and dermal routes has not been well characterized.

Distribution: n-Hexane is widely distributed throughout the body, with higher levels in body fat >> liver, brain, muscle > kidney, heart > lung, blood.

Metabolism: *n*-Hexane is metabolized by mixed function oxidases in the liver to several metabolites, including the neurotoxicant, 2.5-hexanedione.

Excretion: Approximately 10–20% of absorbed *n*-hexane is excreted unchanged in exhaled air; 2,5-hexandione is the primary urinary metabolite.

Physiologically based pharmacokinetic (PBPK) models: A PBPK model has been developed for simulating the absorption, distribution, biotransformation, and excretion of *n*-hexane in humans during inhalation exposure.

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HEALTH EFFECTS

Neurological effects are a known health effect for humans.

- Muscle weakness, numbness, and decreased sensation have been reported in humans exposed to inhaled *n*hexane.
- Reduced motor activity, limb weakness, and paralysis with changes in nerve conduction and nerve histopathology in animals exposed via inhalation or oral exposure.

Respiratory effects following inhalation exposure are a suspected health effect for humans.

- Self-reported respiratory effects have been observed in workers.
- Decreased lung function has been observed in children.
- Nasal effects including damage to the olfactory and respiratory epithelium have been observed in mice.

Developmental effects are a suspected health effect for humans.

 Decreased fetal body weights and litter weights were observed in animals following inhalation or oral exposure. At higher levels, decreases in the number of live fetuses and increases in malformations were observed.

Reproductive effects have also been observed.

• Histological alterations in the testes and epididymis have been observed in animals.

MINIMAL RISK LEVELS (MRLs)

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



Sensitive Effects of Inhalation Exposure to *n*-Hexane

Sensitive Effects of Oral Exposure to *n*-Hexane



Acute: ≤14 days; Intermediate: 15–364 days; Chronic: ≥365 days

Inhalation:

- Acute: An acute-duration inhalation MRL of 6 ppm was derived based on developmental effects in rats.
- Intermediate: An intermediate-duration inhalation MRL of 0.4 ppm was derived based on respiratory effects in mice.
- Chronic: Not derived.

Oral:

- Acute: Not derived.
- Intermediate: An intermediate-duration oral MRL of 0.1 mg/kg/day was derived based on neurological effects in mice.
- Chronic: Not derived.

CANCER

The U.S. Environmental Protection Agency concluded that there is inadequate information to assess the carcinogenic potential of *n*-hexane. The U.S. Department of Health and Human Services and the International Agency for Research on Cancer have not assessed the carcinogenicity of *n*-hexane.

REFERENCE

Agency for Toxic Substances and Disease Registry (ATSDR). 2025. Toxicological profile for *n*-hexane. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=393&tid=68.