



## n-Hexane

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n-Hexane is a chemical made from crude oil. Pure n-hexane is a colorless liquid with a slightly odor. It evaporates very easily into the air and dissolves only slightly in water. n-Hexane is highly flammable, and its vapors can be explosive [ATSDR].

### Usage and exposure

Pure n-hexane is used in laboratories. Most of the n-hexane used in industry is mixed with similar chemicals in products known as solvents. Common names for some of these solvents are “commercial hexane,” “mixed hexanes,” “petroleum ether,” and “petroleum naphtha” [ATSDR].

The major use for solvents containing n-hexane is to extract vegetable oils from crops such as soybeans. They are also used as cleaning agents in the printing, textile, furniture, and shoemaking industries. Certain kinds of special glues used in the roofing and the shoe and leather industries also contain n-hexane [ATSDR].

n-Hexane enters the air, water, and soil during its manufacture and use. Wastes containing n-hexane are sometimes disposed of in landfills. n-Hexane can enter the environment from these landfills. n-Hexane evaporates very easily into the air. n-Hexane released into the air is broken down in a few days. n-Hexane is not stored or concentrated by plants, fish, or animals [ATSDR].

### Routs of exposure

Inhalation, ingestion, skin and/or eye contact [CDC].

Exposure to n-hexane takes place predominantly by the inhalation route. This is due to rapid volatilization of liquid n-hexane. n-Hexane also has a very low

solubility in water, and significant oral exposure through food or drinking water has not been reported. [ATSDR]

### **Target organs**

Eyes, skin, respiratory system, central nervous system, peripheral nervous system [CDC].

### **Metabolism**

Inhaled n-hexane is readily absorbed in the lungs. In humans, the lung clearance (amount present which is absorbed systemically) of n-hexane is on the order of 20-30%. Absorption takes place by passive diffusion through epithelial cell membranes. Absorption by the oral and dermal route has not been well characterized. Inhaled n-hexane distributes throughout the body; based on blood-tissue partition coefficients, preferential distribution would be in the order: body fat>>liver, brain, muscle>kidney, heart, lung>blood. n-Hexane is metabolized by mixed function oxidases in the liver to a number of metabolites, including the neurotoxicant 2,5-hexanedione. Approximately 10-20% of absorbed n-hexane is excreted unchanged in exhaled air, and 2,5-hexanedione is the major metabolite recovered in urine [ATSDR].

### **Health hazards**

Irritation eyes, nose; nausea, headache; peripheral neuropathy: numb extremities, muscle weak; dermatitis; dizziness; chemical pneumonitis (aspiration liquid) [CDC].

Almost all the people known to have had their health affected by exposure to n-hexane used it at work. The risk of health effects in humans depends on the concentration of n-hexane in the air and the duration of exposure [ATSDR].

Prolonged occupational exposures (months to years) to high concentrations ( $\pm 500$  ppm) have resulted in significant human toxicity. Exposure to very high concentrations ( $\pm 10,000$  ppm, e.g. as the result of a spill) could result in narcosis, although the major hazard in this case would be the risk of explosion and fire.

n-Hexane exposure is documented to cause toxicity in peripheral nerves of humans (both sensory and motor) [ATSDR].

Human toxicity associated with n-hexane was first recognized in the 1960s and early 1970s in Japan and Italy. Workers in the shoe industries in these countries developed a peripheral neuropathy that started with numbness in the feet and hands, followed by weakness in the lower legs and feet. In severe cases, paralysis developed. Epidemiological investigations revealed that these illnesses were linked with the use of glues and solvents containing high concentrations of n-hexane. In all cases, poor ventilation was a major factor in the illness. Removal from the workplace resulted in recovery for the patients over the course of several months to 2 years.

It is not known if oral or skin exposure to n-hexane can cause these effects in people [ATSDR].

If somebody is exposed to high concentrations of n-hexane over a long period, one of these breakdown products may cause damage to the nervous system. 2,5-hexanedione, is believed to be the ultimate toxic agent in n-hexane-induced neurotoxicity. Most of these breakdown products leave the body in the urine within a day or two. n-Hexane and its breakdown products are not stored in the body [ATSDR].

No epidemiological studies were located addressing whether there is or is not an association between occupational n-hexane exposure and cancer. n-Hexane has not been tested for carcinogenicity in animals and has not been categorized as to its potential for carcinogenicity by the International Agency for Research on Cancer [ATSDR].

## References

- ATSDR, Agency for Toxic Substances & Disease Registry. Toxicological Profile for n-Hexane.  
<https://www.atsdr.cdc.gov/ToxProfiles/tp113.pdf>
- CDC, Centers for Disease Control and Prevention. NIOSH Pocket Guide to Chemical Hazards. n-Hexane.  
<https://www.cdc.gov/niosh/npg/npgd0322.html>