Sources of Exposure

General Populations

- The most likely routes of exposure for the general population to isophorone are by inhalation in air and ingestion of isophorone in water.
- Isophorone is released to the air mainly in urban centers, as a result of evaporation of isophorone-containing solvents.
- Isophorone, in addition to several other volatile compounds, was extracted from inflatable aquatic toys, providing an exposure pathway for children.

Occupational Populations

- Occupational exposure to isophorone may occur through inhalation or dermal contact.
- Workers with potentially high exposure include screen print workers, adhesives formulators and users, and coatings manufacturing and use workers.

Toxicokinetics and Biomonitoring

Toxicokinetics

- The limited data on toxicokinetics of isophorone comes from animal studies.
- Isophorone is absorbed following inhalation, oral, and dermal exposure. However, quantitative estimates of bioavailability have not been determined for any route of exposure.
- Isophorone is widely distributed throughout the body, although percentages of the absorbed dose distributed to each tissue have not been reported.
- Several metabolites of isophorone have been identified in urine. Proposed metabolic schemes for isophorone include several types of reactions, including methyl oxidation, reduction, dismutation, and conjugation.
- Urine appears to be the primary excretory pathway for isophorone and metabolites. Some excretion occurs through exhaled air and fecal excretion.

NHANES Biomonitoring

- There are no data regarding levels of isophorone in the general population.

Biomarkers/Environmental Levels

Biomarkers

- There are no specific biomarkers for isophorone.

Environmental Levels

Air

- There are no recent monitoring data for air levels isophorone in the United States.

Water

- There are no recent monitoring data for water levels of isophorone in the United States.

Sediment and Soil

- There are no monitoring data for levels of isophorone in the sediment or soil in the United States.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2018. Toxicological Profile for Isophorone. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

ToxGuide™ for Isophorone

$C_9H_{14}O$

CAS # 78-59-1

July 2018

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

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Chemical and Physical Information

Isophorone

- Isophorone is clear liquid with a peppermint-like odor.
- It can be dissolved in water and is more volatile than water.
- Isophorone is an industrial chemical used as solvent for many natural and synthetic polymers, resins, waxes, fats, and oils.
- Specifically, it is used as a solvent for concentrated vinyl chloride/acetate-based coating systems for metal cans, metal paints, nitrocellulose finishes, printing inks for plastics, some herbicide and pesticide formulations, adhesives with food contract, and adhesives for plastics, poly(viny1)chloride and polystyrene materials.
- Although isophorone is a manufactured chemical, it also occurs naturally in cranberries.

Routes of Exposure

- Inhalation – Likely route of exposure for the general and occupational populations.
- Oral – Likely route of exposure for the general population through ingestion of contaminated food and water.
- Dermal – Likely route of exposure for occupational population.

Isophorone in the Environment

- Most environmental releases are to the air from evaporation during and after use
- Isophorone can enter surface waters from industrial effluent discharges or from runoff from soils at hazardous waste or other contaminated sites.
- Isophorone disappears rapidly in air by hydroxyl radical reaction (half-life <5 hours) but may persist in natural waters for up to a month.
- Volatilization and sorption are not expected to be significant removal mechanisms from water.
- In soils, isophorone is expected to be degraded by microbes.

Relevance to Public Health (Health Effects)

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-(≤14 days), intermediate-(15–364 days), or chronic (≥365 days) duration inhalation MRLs were derived for isophorone.

Oral

- No acute duration (≤14 days) oral MRL was derived for isophorone.
- An intermediate duration (15–364 days) oral MRL of 3 mg/kg/day was derived for isophorone.
- A chronic duration (≥365 days) oral MRL of 0.2 mg/kg/day was derived for isophorone.

Health Effects

- Respiratory tract and ocular irritation have been observed in human subjects (acute duration) and laboratory animals (acute-, intermediate-, and chronic-duration) exposed to isophorone in air.
- Respiratory effects, including irritation, respiratory congestion, and hemorrhagic lungs, have been observed in laboratory animals.
- In animals, dermal and ocular irritation and damage occurred following direct contact exposure.
- Chronic inhalation and oral exposure resulted in hepatic toxicity and renal inflammation in laboratory animals.
- Chronic oral exposure produced gastrointestinal lesions in animals.
- Neurological effects, including CNS depression, lethargy, neurobehavioral effects, and staggering, have been observed in laboratory animals following acute-duration inhalation exposure and acute- and intermediate-duration oral exposure to isophorone.
- Following chronic oral exposure of laboratory animals to isophorone, lymphoma and tumors of the liver, skin, and preputial gland have been observed.
- The U.S. Department of Health and Human Services and the International Agency for Research on Cancer have not categorized the carcinogenicity of isophorone. EPA categorized isophorone as a possible human carcinogen (Group C) based on no data in humans and limited evidence of carcinogenicity in animals.

Children's Health

- It is not known if children are more sensitive to isophorone exposure than adults.