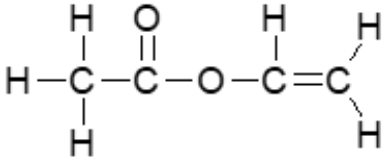
VINYL ACETATE - TOXGUIDE™

CHEMICAL AND PHYSICAL INFORMATION

Vinyl acetate (CASRN 108-05-4) is a colorless liquid with a sweet, fruity smell. It is a man-made compound that is used in the production of polymers and copolymers, including polyvinyl acetate, polyvinyl alcohol, polyvinyl acetals, ethylene-vinyl acetate copolymer, and polyvinyl chloride-acetate copolymer.



Consumer and commercial uses include use in adhesives, paints and powder coatings, plastics and resins, rubber foam, packaging, sporting equipment (e.g., ski boots, bicycle seats), auto-related films, and intermediates in construction and building materials. Vinyl acetate also has a few approved uses as a food additive (masticatory substance, solvent/vehicle) and as a component in polymerized food packaging (e.g., ethylene-vinyl acetate copolymers).

ENVIRONMENTAL FATE AND DETECTED LEVELS

Air: The median vinyl acetate levels recorded from air monitoring sites across the United States were 0.173 ppbv (range: less than the level of detection [LOD]–5.38 ppbv) in 2022 and 0.125 ppbv (range: <LOD–1.78 ppbv) in 2023.

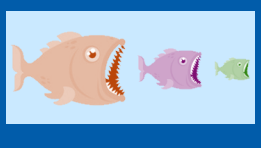
Vinyl acetate is a volatile compound that is released mainly to the atmosphere. Due to solubility, vinyl acetate released to the atmosphere is expected to redeposit to surface waters and soil through precipitation. Any vinyl acetate remaining in the atmosphere is rapidly broken down by photochemical oxidation with an atmospheric lifetime on the order of hours to days.

Water: Between 2010 and 2019, vinyl acetate was only detected in 3% of ambient surface water samples from sites across the United States, with an average of 1.2 µg/L (range 0.5–2 µg/L; n=594); more recent data are not available. Between 2010 and 2019, vinyl acetate was detected in 11% of ambient groundwater samples at an average concentration of 7.6 µg/L (range 1–100 µg/L; n=6,410). Vinyl acetate levels were <LOD in samples collected between 2020 and 2024.

In surface water and groundwater, vinyl acetate undergoes hydrolysis and biotransformation, with half-lives on the order of hours to days.

Sediment and Soil: Recent monitoring data for ambient sediment and soil levels are limited to state-specific sites; all reports indicate that levels are <LOD.

Vinyl acetate is expected to be highly mobile in soils and is likely to partition to groundwater when released to subsurface soils. Vinyl acetate remaining in soil undergoes hydrolysis and biotransformation, with half-lives on the order of hours to days.



Bioconcentration: Vinyl acetate is unlikely to bioconcentrate/biomagnify in terrestrial or aquatic organisms/food chains.

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GENERAL POPULATION EXPOSURE

General population exposure to vinyl acetate is expected to be low.

Primary route of potential exposure: Inhalation

- Inhalation exposure is most likely via of contaminated ambient air or cigarette smoke. However, vinyl acetate was detected infrequently and at very low levels in the air of residence and office buildings.
- Inhalation exposure may occur during household water use (e.g., showering, bathing, washing of dishes or clothes) if the water contains vinyl acetate.

Possible routes of potential exposure: Oral and Dermal

- Oral exposure may occur via ingestion of residual vinyl acetate monomers in food (that may have migrated from plastic food wraps) or food items containing the compound as a starch modifier.
- Dermal contact may occur when using products containing the compound (e.g., glues and paints).
- Dermal exposure may occur during household water use (e.g., showering, bathing, washing of dishes or clothes) if the water contains vinyl acetate.

POPULATIONS WITH POTENTIALLY HIGH EXPOSURE

Workers involved in manufacturing adhesive, petrochemical, paint and coating, or plastics and resin may be exposed to vinyl acetate via:

- Inhalation of contaminated workplace air
- Dermal contact with vinyl acetate vapor or liquids
- Dermal contact with products containing the compound

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, groundwater contamination, and/or vapor intrusion).

BIOMARKERS

There are no specific biomarkers for vinyl acetate exposure.

Vinyl acetate breaks down very quickly in the body to substances that are normally found in the body; thus, measurement of these break down products is not useful for determining whether exposure to vinyl acetate has occurred.

BIOMONITORING LEVELS

There are no data regarding levels of vinyl acetate in the general U.S. population.

TOXICOKINETICS

Absorption: Vinyl acetate is rapidly and effectively absorbed via the inhalation and oral route. However, vinyl acetate is expected to be absorbed to some degree based on lethality reported in a single rabbit study following exposure to a highly concentrated dermal dose.

Distribution: Vinyl acetate is rapidly and widely distributed in rodents, with the highest concentration in the Harderian gland, salivary glands, lacrimal glands, gastrointestinal mucosa, and respiratory tract.

Metabolism: Vinyl acetate is rapidly hydrolyzed by carboxylesterases to form acetaldehyde and acetic acid.

Excretion: Vinyl acetate is eliminated rapidly from the body, primarily through expired air as carbon dioxide.

Physiologically based pharmacokinetic (PBPK) models: Available *in vivo* and *in vitro* data have been utilized to develop PBPK models to simulate the kinetics of vinyl acetate uptake and metabolism in the nasal cavity in rats and humans.

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HEALTH EFFECTS

Sensitive noncarcinogenic effects in laboratory animals following vinyl acetate exposure include respiratory effects (inhalation) and developmental effects (inhalation, oral). Decreased body weight effects were also noted in some studies; however, assessment of compound-related effects on body weight is difficult due to concomitant decreases in water and/or food intake. Therefore, systematic review was restricted to respiratory and developmental endpoints.

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

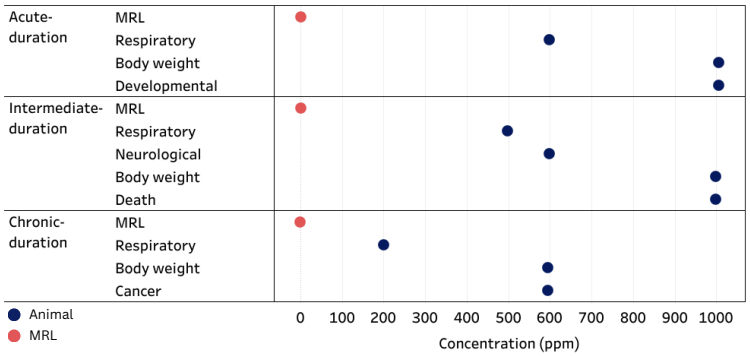
Respiratory system effects are a presumed health effect for humans following inhalation exposure.

- Exposure to vinyl acetate via inhalation in humans resulted in irritation to the nose and throat
- The nasal cavity appears to be the most sensitive target tissue in rats and mice following inhalation exposure.
- Degenerative, necrotic, and/or hyperplastic lesions were seen in the olfactory epithelium of the nasal cavity following inhalation exposure in rats.

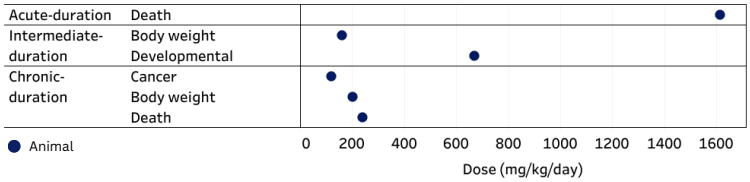
The data are inadequate to conclude whether developmental effects are a health in humans following exposure.

- Decreased fetal growth and delayed ossification were observed in rat fetuses following maternal exposure during gestation; findings may have been secondary to decreased maternal weight.

Sensitive Effects of Inhalation Exposure to Vinyl Acetate



Sensitive Effects of Oral Exposure to Vinyl Acetate



MINIMAL RISK LEVELS (MRLs)

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

Inhalation:

- **Acute:** An acute-duration inhalation MRL of 1 ppm (3.5 mg/m^3) was derived based on nasal lesions in rats.
- **Intermediate:** An intermediate-duration inhalation MRL of 0.7 ppm (2.5 mg/m^3) was derived based on nasal lesions in rats.
- **Chronic:** A chronic-duration inhalation MRL of 0.3 ppm (1.1 mg/m^3) was derived based on nasal lesions in rats.

Oral: No oral MRLs were derived for any duration.

CANCER

Chronic inhalation or oral exposure in rodents was associated with neoplastic lesions in the upper respiratory system, oral cavity, and upper gastrointestinal tract.

The International Agency for Research on Cancer (IARC) has determined that vinyl acetate is possibly carcinogenic to humans based on inadequate evidence in humans and limited evidence in experimental animals. The Department of Health and Human Services and U.S. Environmental Protection Agency (EPA) have not evaluated the potential for vinyl acetate to cause cancer in humans.

REFERENCE

Agency for Toxic Substances and Disease Registry (ATSDR). 2025. Toxicological profile for vinyl acetate. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services. https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=671&tid=124.