Occupational Health Guideline for
Isoamyl Acetate

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

SUBSTANCE IDENTIFICATION

- Formula: CH₃COOCH₂CH₂CH₃(C₂H₅)₂
- Synonyms: Banana oil; 3-methyl-1-butanol acetate; 2-methylbutyl ethanoate
- Appearance and odor: Clear, colorless liquid with a banana-like odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for isoamyl acetate is 100 parts of isoamyl acetate per million parts of air (ppm) averaged over an eight-hour work shift. This may also be expressed as 525 milligrams of isoamyl acetate per cubic meter of air (mg/m³).

HEALTH HAZARD INFORMATION

- Routes of exposure
  Isoamyl acetate can affect the body if it is inhaled, comes in contact with the eyes or skin, or is swallowed.
- Effects of overexposure
  1. Short-term Exposure: Overexposure to isoamyl acetate may cause irritation of the eyes, nose, and throat. Overexposure may also cause headache, drowsiness, and unconsciousness.
  2. Long-term Exposure: Prolonged overexposure may cause irritation of the skin.
  3. Reporting Signs and Symptoms: A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to isoamyl acetate.
- Recommended medical surveillance
  The following medical procedures should be made available to each employee who is exposed to isoamyl acetate at potentially hazardous levels:
  1. Initial Medical Screening: Employees should be screened for history of certain medical conditions (listed below) which might place the employee at increased risk from isoamyl acetate exposure.
     - Chronic respiratory disease: In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of isoamyl acetate might cause exacerbation of symptoms due to its irritant properties.
     - Skin disease: Isoamyl acetate is a defatting agent and can cause dermatitis on prolonged exposure. Persons with pre-existing skin disorders may be more susceptible to the effects of this agent.
     - Kidney disease: Although isoamyl acetate is not known as a kidney toxin in humans, the importance of this organ in the elimination of toxic substances justifies special consideration in those with possible impairment of renal function.
     - Liver disease: Although isoamyl acetate is not known as a liver toxin in humans, the importance of this organ in the biotransformation and detoxification of foreign substances should be considered before exposing persons with impaired liver function.
  2. Periodic Medical Examination: Any employee developing the above-listed conditions should be referred for further medical examination.
- Summary of toxicology
  The toxicologic effects of isoamyl acetate are probably similar to those of amyl acetate: chiefly irritation of the conjunctiva and upper respiratory tract, followed by gradual onset of narcosis, with slow recovery after exposure ceases. Men exposed to 950 ppm for 30 minutes reported only irritation of the nose and throat, headache, and weakness; cats exposed to 1900 ppm for 2 to 3 hours per day for a week showed only irritation, weakness, and loss of weight; dogs exposed to 5000 ppm

These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service    Centers for Disease Control
National Institutes for Occupational Safety and Health

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

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for 1 hour had nasal irritation and drowsiness. No chronic systemic effects have been reported in humans.

**CHEMICAL AND PHYSICAL PROPERTIES**

- **Physical data**
  1. Molecular weight: 130.2
  2. Boiling point (760 mm Hg): 145.6 °C (294 °F)
  3. Specific gravity (water = 1): 0.87
  4. Vapor density (air = 1 at boiling point of isooamyl acetate): 4.5
  5. Melting point: −100 °C (−148 °F)
  6. Vapor pressure at 20 °C (68 °F): 4 mm Hg
  7. Solubility in water, g/100 g water at 20 °C (68 °F): 0.2
  8. Evaporation rate (butyl acetate = 1): 0.42

- **Reactivity**
  1. Conditions contributing to instability: Heat
  2. Incompatibilities: Contact with nitrates, strong oxidizers, strong alkalies, and strong acids may cause fires and explosions.
  3. Hazardous decomposition products: Toxic gases and vapors (such as carbon monoxide) may be released in a fire involving isooamyl acetate.
  4. Special precautions: None

- **Flammability**
  1. Flash point: 25 °C (77 °F) (closed cup)
  2. Autoignition temperature: 360 °C (680 °F)
  3. Flammable limits in air, % by volume: Lower: 1.0 (at 100 °C (212 °F)); Upper: 7.5
  4. Extinguisher: Dry chemical, carbon dioxide, foam

- **Warning properties**
  1. Odor Threshold: By analogy to amyl acetate, which has an odor threshold of 7 ppm (Handbook of Industrial Organic Solvents), the odor of isooamyl acetate is assumed to be detectable below the permissible exposure limit (100 ppm).
  2. Eye Irritation Level: The Handbook of Industrial Organic Solvents indicates that significant eye and nose irritation does not occur below the threshold limit.
  3. Other Information: According to the Documentation of TLVs, the “threshold limit of 100 ppm is recommended to prevent significant irritation of the respiratory passages.”
  4. Evaluation of Warning Properties: For the purposes of this guideline, isooamyl acetate is treated as a material with good warning properties.

**MONITORING AND MEASUREMENT PROCEDURES**

- **General**
  Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee’s breathing zone (air that would most nearly represent that inhaled by the employee).

- **Method**
  Sampling and analyses may be performed by collection of isooamyl acetate vapors using an adsorption tube with subsequent desorption with carbon disulfide and gas chromatographic analysis. Also, detector tubes certified by NIOSH under 42 CFR Part 84 or other direct-reading devices calibrated to measure isooamyl acetate may be used. An analytical method for isooamyl acetate is in the NIOSH Manual of Analytical Methods, 2nd Ed., Vol. 2, 1977, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00260-6).

**RESPIRATORS**

- Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.

  - In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

**PERSONAL PROTECTIVE EQUIPMENT**

- Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact with liquid isooamyl acetate.

- Clothing wet with liquid isooamyl acetate should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of isooamyl acetate from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the isooamyl acetate, the person performing the operation should be informed of isooamyl acetate's hazardous properties.

- Any clothing which becomes wet with liquid isooamyl acetate should be removed immediately and not re-worn until the isooamyl acetate is removed from the clothing.
- Employees should be provided with and required to use splash-proof safety goggles where liquid isoamyl acetate may contact the eyes.

**SANITATION**

- Skin that becomes wet with liquid isoamyl acetate should be promptly washed or showered with soap or mild detergent and water to remove any isoamyl acetate.

**COMMON OPERATIONS AND CONTROLS**

The following list includes some common operations in which exposure to isoamyl acetate may occur and control methods which may be effective in each case:

<table>
<thead>
<tr>
<th>Operation</th>
<th>Controls</th>
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<tbody>
<tr>
<td>Liberation during manufacture of shoe polish and furniture polish; during fermentation of whiskey grains</td>
<td>General dilution ventilation</td>
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<tr>
<td>Liberation during manufacture of cellulose photographic film by formation from solvent solutions</td>
<td>General dilution ventilation; local exhaust ventilation</td>
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<tr>
<td>Liberation during preparation of perfumes, foods, and other materials for use as flavoring or odorant</td>
<td>General dilution ventilation</td>
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<tr>
<td>Liberation during use as an extractant in purification of pharmaceuticals, including penicillin</td>
<td>General dilution ventilation; local exhaust ventilation</td>
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<tr>
<td>Liberation during cleaning and maintenance of acetate-processing equipment, such as kettles, distillation columns, and storage vessels</td>
<td>Personal protective equipment</td>
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<tr>
<td>Liberation during manufacture of bath sponges</td>
<td>General dilution ventilation</td>
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<tr>
<td>Liberation during manufacture of artificial leathers</td>
<td>General dilution ventilation; local exhaust ventilation</td>
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<tr>
<td>Liberation during manufacture of artificial silk, rayon, and pearls; during manufacture and use of bronzing fluids</td>
<td>General dilution ventilation</td>
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<tr>
<td>Liberation during use in dry cleaning preparations</td>
<td>General dilution ventilation</td>
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<tr>
<td>Use in treating of natural leathers by tanning</td>
<td>General dilution ventilation; local exhaust ventilation; personal protective equipment</td>
</tr>
<tr>
<td>Liberation during spray application of varnishes and nitrocellulose lacquers as protective and finish coatings for wood, especially in furniture industry, and on plastic, metal, leather, and other surfaces</td>
<td>Local exhaust ventilation; personal protective equipment</td>
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<tr>
<td>Liberation during manual application of cellulose adhesives, including household cements</td>
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</table>
1. Remove all ignition sources.
2. Ventilate area of spill or leak.
3. For small quantities, absorb on paper towels. Evaporate in a safe place (such as a fume hood). Allow sufficient time for evaporating vapors to completely clear the hood ductwork. Burn the paper in a suitable location away from combustible materials. Large quantities can be collected and atomized in a suitable combustion chamber. Isoamyl acetate should not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.

- Waste disposal methods:
  Isoamyl acetate may be disposed of:
  1. By absorbing it in vermiculite, dry sand, earth or a similar material and disposing in a secured sanitary landfill.
  2. By atomizing in a suitable combustion chamber.

REFERENCES

# RESPIRATORY PROTECTION FOR ISOAMYL ACETATE

<table>
<thead>
<tr>
<th>Condition</th>
<th>Minimum Respiratory Protection* Required Above 100 ppm</th>
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<tr>
<td><strong>Vapor Concentration</strong></td>
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<tr>
<td>1000 ppm or less</td>
<td>A chemical cartridge respirator with a full facepiece and an organic vapor cartridge(s).</td>
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<td>Any supplied-air respirator.</td>
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<tr>
<td></td>
<td>Any self-contained breathing apparatus.</td>
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<tr>
<td>3000 ppm or less</td>
<td>A gas mask with a chin-style or a front- or back-mounted organic vapor canister.</td>
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<tr>
<td></td>
<td>Any supplied-air respirator with a full facepiece, helmet, or hood.</td>
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<tr>
<td></td>
<td>Any self-contained breathing apparatus with a full facepiece.</td>
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<tr>
<td><strong>Greater than 3000 ppm or entry and escape from unknown concentrations</strong></td>
<td>Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.</td>
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<td></td>
<td>A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.</td>
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<tr>
<td><strong>Fire Fighting</strong></td>
<td>Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.</td>
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<td><strong>Escape</strong></td>
<td>Any gas mask providing protection against organic vapors.</td>
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<td></td>
<td>Any escape self-contained breathing apparatus.</td>
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*Only NIOSH-approved or MSHA-approved equipment should be used.