Propionic Acid


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Names
- CAS No. 79-09-4
- EC No. 201-176-3
- Ethyl formic acid
- Ethanecarboxylic acid
- Methyl acetic acid
- Propanoic acid
- Propionic acid

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Product Overview
- Propionic acid is a colorless, oily liquid with a pungent, rancid odor. It occurs naturally in dairy products and is a byproduct of human metabolism.¹² For further details, see Product Description.
- Propionic acid is manufactured primarily for use as a preservative and anti-mold agent in animal feed and grain. It is also used as a preservative and flavoring agent in packaged foods such as baked goods and cheese. Calcium propionate and sodium propionate, the salt forms of propionic acid, are used in bread and tortillas to prevent mold. In addition, propionic acid is used as a chemical building block for the production of herbicides, pharmaceuticals, dyes, textile and rubber products, plastics, plasticizers, cosmetics, and perfumes.³⁴ For further details, see Product Uses.
- As a food additive, propionic acid is listed as “Generally Recognized as Safe” (GRAS) by the U.S. Food and Drug Administration (FDA) as an antimicrobial agent and flavoring agent. It is a normal component of metabolism in the human body. Eye contact with concentrated propionic acid may cause severe irritation, with corneal injury possibly resulting in permanent impairment of vision, even blindness. Propionic acid is classified as corrosive to the skin. Skin contact may cause burns, pain, severe local redness, and tissue damage. Prolonged or widespread skin contact is unlikely to result in absorption of harmful amounts. Excessive inhalation may cause irritation to the nose and throat. Error! Bookmark not defined. For further details, see Health Information.
- Consumers may be exposed to propionic acid by consuming meat, milk, poultry, or baked goods containing it. However, since propionic acid is metabolized by livestock and poultry, residues in meat, milk, or poultry are negligible. Error! Bookmark not defined. Workplace exposure is also possible. Error! Bookmark not defined. For further details, see Exposure Potential.
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- Propionic acid is a vapor explosion hazard. Vapors are heavier than air and may travel long distances and ignition or flashback may occur. Propionic acid is stable under recommended storage conditions. Error! Bookmark not defined. For further details, see Physical Hazard Information.

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Manufacture of Product

- **Capacity** – Dow manufactures propionic acid at facilities in Texas City, Texas, in the United States.
- **Process** – Dow manufactures propionic acid using the oxo process. Ethylene is reacted with synthesis gas (carbon monoxide and hydrogen mixture) in the presence of a catalyst, yielding propionaldehyde. In a separate unit, propionaldehyde is then oxidized to propionic acid.

\[ \text{Ethylene} + \text{Synthesis gas} \rightarrow \text{Propionaldehyde} \]

\[ \text{Propionaldehyde} + \frac{1}{2} \text{O}_2 \rightarrow \text{Propionic acid} \]

Product Description

Propionic acid is a colorless, oily liquid with a pungent, rancid odor. It occurs naturally in dairy products and is a normal component of human metabolism. Propionic acid is also produced during metabolism in cows and other grazing mammals. In humans, it is produced in small amounts from the breakdown of amino acids and the oxidation of fatty acids. Propionic acid is produced in small amounts in the environment as a byproduct of burned wood (pyrolysis) and by certain bacteria.

Product Uses

Propionic acid is mainly used as a preservative in stored animal feed and grain. It is technically a fungicide (molds) and bactericide. Over 75% of propionic acid used for this purpose is in the form of the salt, ammonium propionate, because it is less corrosive to farm equipment. Specific agricultural applications are:

- High moisture grains in indoor storage (oats, corn, barley, wheat, and sorghum)
- Hay
- Livestock and poultry drinking water additive (antibacterial)
- Storage areas for silage and grain (surface sanitizer)
- Poultry-litter additive

Other uses for propionic acid include:

- Preservative and flavoring agent for baked goods and cheese
- Food additives to prevent mold in bread, tortillas, and cheese (as calcium propionate and sodium propionate)
- Cellulose acetate propionate (CAP) production
- Chemical intermediate for herbicides, pharmaceuticals, dyes, textile and rubber products, plastics, plasticizers, cosmetics, and perfumes
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Exposure Potential
Propionic acid is used in the production of industrial and consumer products. Based on the uses for propionic acid, the public could be exposed through:

- **Workplace exposure** – Exposure can occur either in a propionic acid manufacturing facility or in the various industrial or manufacturing facilities that use it. Those working with propionic acid in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. Agricultural workers could be exposed while applying propionic acid to grain, forage, poultry-litter, or grain-storage areas. Each facility should have a thorough training program for employees and appropriate work processes and safety equipment in place to limit unnecessary exposure. See Health Information.

- **Consumer exposure to products containing propionic acid** – Dow does not sell propionic acid for direct consumer use. Consumers may be exposed to propionic acid by consuming meat, milk, poultry, or baked goods containing it. However, since propionic acid is rapidly metabolized by livestock and poultry, residues in meat, milk, or poultry are negligible. See Health Information.

- **Environmental releases** – In the event of a spill, the focus is on containing the spill to prevent contamination of soil, ditches, sewers, waterways, or groundwater. Small spills should be neutralized by adding materials such as alkaline soap and water. See Environmental, Health, and Physical Hazard Information.

- **Large release** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, contain the spilled material if possible. Isolate the area and evacuate unnecessary personnel. Eliminate all sources of ignition. Propionic acid vapors are heavier than air and may travel long distances, posing an explosion hazard. Use appropriate safety equipment. Ground and bond all containers and handling equipment. Pump the recovered material with explosion-proof equipment. If available, use foam to smother or suppress vapors. Collect the recovered material in suitable and properly labeled containers.

In case of fire – Keep people away and deny unnecessary entry. Stay upwind, keeping out of low-lying areas where gases (fumes) can accumulate. Wear positive-pressure, self-contained breathing apparatus (SCBA) and protective fire-fighting clothing. Avoid contact with this material during fire-fighting operations. Use water fog or fine spray, dry-chemical or carbon-dioxide fire extinguishers, or foam. Do not use a direct water stream as it may spread the fire. Use water spray to cool containers exposed to fire and the fire-affected zone until fire is out and danger of reignition has passed. Follow emergency procedures carefully. See Environmental, Health, and Physical Hazard Information.

For more information, see the relevant Safety Data Sheet.

Health Information
As a food additive, propionic acid is listed as “Generally Recognized as Safe” (GRAS) by the U.S. Food and Drug Administration (FDA). Propionic acid is a normal component of human metabolism.

**Eye and Skin Contact** – Eye contact with concentrated propionic acid may cause severe irritation with corneal injury, possibly resulting in permanent impairment of vision, even blindness. Chemical burns may occur. Vapor may cause eye irritation experienced as mild discomfort and redness. Propionic acid is classified as corrosive to the skin. Skin contact may cause burns, pain, severe local redness, and tissue damage. Prolonged or widespread skin contact is unlikely to result in absorption of harmful amounts.

**Inhalation** – Inhaling excessive amounts of propionic acid may cause irritation to the nose and throat.

**Ingestion** – Propionic acid has low systemic toxicity if swallowed. Swallowing small amounts as a result of normal handling operations is unlikely to cause injury; however, swallowing larger amounts may cause injury. Swallowing concentrated propionic acid may result in irritation or burns to the mouth, throat, and gastrointestinal tract. Aspiration into the lungs may occur during ingestion or vomiting, causing tissue damage or lung injury.

**Cancer and Birth Defect Information** – Propionic acid caused precancerous changes in the stomachs of rats when ingested in large amounts. These findings are believed to be a result of the irritation properties of propionic acid. It did not cause birth defects or any other fetal effects in laboratory animals. In vitro genetic studies and animal genetic studies on propionic acid were negative.

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For more information, see the relevant Safety Data Sheet.

Environmental Information
Propionic acid is not likely to accumulate in the food chain (bioconcentration potential is low) and is biodegradable. In the environment, it is metabolized by various microbes into carbon dioxide and water.

Propionic acid is slightly toxic to aquatic organisms on an acute basis. It may decrease the pH of aquatic systems to less than pH 5, which may be toxic.

Physical Hazard Information
Propionic acid liquid and vapors are combustible. Vapors are heavier than air and may travel long distances and accumulate in low-lying areas. Propionic acid is stable under recommended storage conditions. Exposure to elevated temperatures can cause propionic acid to decompose. Decomposition products depend upon temperature, air supply, and the presence of other materials, but may include carbon monoxide, carbon dioxide, and other materials.

Regulatory Information
Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of propionic acid. These regulations may vary by city, state, country, or geographic region. Information may be found by consulting the relevant Safety Data Sheet, Technical Data Sheet, or Contact Us.

Additional Information
- Safety Data Sheet (http://www.dow.com/webapps/msds/msdssearch.aspx)
- Contact Us (http://www.dow.com/oxysolvents/contact/index.htm)
- Propionic Acid Technical Data Sheet, The Dow Chemical Company, Form No. 327-00019-0812
- Propanoic Acid, and Its Calcium and Sodium Salts; Exemption from the Requirement of a Tolerance

For more business information about propionic acid, visit Dow’s Oxygenated Solvents website: http://www.dow.com/oxysolvents/
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References
1 Propionic Acid Safety Data Sheet, The Dow Chemical Company, ID No. 1540/1001
3 Propionic Acid Technical Data Sheet, The Dow Chemical Company, Form No. 327-00019-0812

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