Product Safety Assessment

Glutaraldehyde


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Names
- CAS No. 111-30-8
- Glutaraldehyde
- 1,5-pentanedial
- 1,5-pentanediol
- Glutaric dialdehyde
- Glutaral
- AUCAR™ Water Treatment Microbiocide
- BIOBAN™ Antimicrobial
- UCARCIDE™ Antimicrobials
- UCARSAN™ Sanitizer
- GLUTEX™ Sanitizer
- PIROR™ Slimicides

Product Overview
- Glutaraldehyde is a clear liquid with a fruity odor. Product formulations marketed by Dow are sold as water solutions containing up to 50% active ingredient.¹ ² For further details, see Product Description.
- Glutaraldehyde is a broad-spectrum antimicrobial agent used in a variety of applications, including industrial, institutional, consumer, and household products.³ For further details, see Product Uses.
- Personnel working with glutaraldehyde-containing products in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. Consumers could be exposed to very low levels of glutaraldehyde, since it is used in medical disinfectants and personal care products.⁴ For further details, see Exposure Potential.
- Contact with the eyes may cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness. Chemical burns may occur. Brief skin contact may cause skin burns. Skin contact may cause allergic reaction. Inhalation of vapor may cause severe irritation of the upper respiratory tract (nose and throat). This material is moderately toxic if swallowed, and may be harmful if absorbed through the skin.⁵ For further details, see Health Information.
- According to OECD test guidelines, glutaraldehyde is biodegradable in soil and water and has no bioaccumulative properties (does not accumulate in the food chain). This material is highly toxic (US classification)/very toxic (EU classification) to aquatic organisms on an acute basis.⁶ ⁷ For further details, see Environmental Information.
- Glutaraldehyde is thermally stable at recommended storage and use conditions, but may decompose at elevated temperatures. Avoid contact with amines, ammonia, strong acids, strong bases, and strong oxidizers, as well as metals such as aluminum, carbon steel, copper, iron, and mild steel.⁸ For further details, see Physical Hazard Information.

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Manufacture of Product
- Locations – The global market for biocides, including glutaraldehyde, was 558 thousand metric tonnes in 2004 (1.2 billion pounds). Glutaraldehyde is produced at Institute, West Virginia, a site managed by Union Carbide Corporation, a wholly owned subsidiary of Dow.
- Structure – The structure of glutaraldehyde is shown below.

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Product Description
Glutaraldehyde is an oily, clear liquid with a pungent, fruity odor. Glutaraldehyde formulations are marketed by Dow under the trade names AQUCAR™, BIOBAN™, UCARCIDE™, UCARSAN™, GLUTEX™, and PIROR™. These formulations are sold as water solutions containing 4 to 50% active ingredient. Some of the formulations may contain other active ingredients. The formulations typically are diluted to 50 to 2000 parts per million for use.

Product Uses
Glutaraldehyde is widely used as a broad-spectrum antimicrobial agent that is effective against bacteria and viruses over a wide range of temperature and pH conditions. Glutaraldehyde-containing formulations address the needs of a variety of industries.
- Agriculture – for sanitizing animal housing buildings and equipment.
- Metalworking fluids (not a use in Europe) – to control bacteria and fungi in water-based metalworking fluids, conveyor lubricants, and heat-transfer systems.
- Oil and gas operations – to control bacterial growth in water-flood injection water; drilling, completion, workover, and fracturing fluids; pipeline pigging and scraping; produced waters; oil and gas transmission lines; gas-storage wells and hydrocarbon-storage tanks; and production wells.
- Water treatment – to control slime-forming bacteria, and sulfate-reducing bacteria, in water for cooling towers, air washers, pasteurizers, industrial wastewater, and other recirculating water systems.
- Medical and dental – to disinfect equipment.
- Paper manufacturing – to control microorganisms in paper mills and paperboard manufacture.
- Cosmetics and personal-care products – used as a preservative.
Nonbiocidal applications for glutaraldehyde include use as a cross-linking agent for certain polymers, leather, electron microscopy, photographic (particularly x-ray) development and enzymes, and as a tanning agent.

Exposure Potential
Glutaraldehyde is used as a preservative, disinfectant, and antimicrobial agent in industrial and consumer products. Based on the uses for this product, the public could be exposed through:
- Workplace exposure – Exposure can occur either in a facility that manufactures glutaraldehyde or in the various industrial or manufacturing facilities that use glutaraldehyde. It is produced, distributed, stored, and consumed in closed systems. Those working with glutaraldehyde in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. Each manufacturing facility should have a thorough training program for employees and appropriate work processes, ventilation, and safety equipment in place to limit exposure. The ACGIH recommended Occupational Exposure Limit is 0.05 ppm ceiling SEN. See Health Information.

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- **Consumer exposure to products containing glutaraldehyde** – Dow does not sell glutaraldehyde for direct consumer use, but it is used as a preservative and antimicrobial agent in personal-care products used by the general public, as well as paint and other household cleaning and maintenance products. Glutaraldehyde has been evaluated by the Cosmetic Ingredient Review (CIR) Expert Panel and deemed safe as a cosmetic ingredient. Always read and follow product label instructions before use. See **Health Information**.

- **Environmental releases** – In the event of a spill, the focus is on containing the spill to prevent contamination of soil and surface or ground water. Respiratory protection is necessary for cleaning up spills and leaks. An approved air-purifying respirator (e.g., organic vapor cartridge with a particulate pre-filter, type AP2) is recommended. Eliminate all sources of ignition immediately. For small spills, glutaraldehyde should be absorbed with materials such as sand, then collected and sealed in polyethylene bags, and placed in a drum for transit to an approved disposal site. Deactivation with sodium bisulfite is recommended prior removal of the spills. This material is considered highly toxic (US classification)/very toxic (EU classification) to aquatic organisms on an acute basis. See **Environmental, Health, and Physical Hazard Information**.

- **Large release** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, the material should be captured, collected, and reprocessed or disposed of according to applicable governmental requirements. Deactivation with Sodium bisulfite is recommended prior removal of the spills. An approved air-purifying respirator (e.g., organic vapor cartridge with a particulate pre-filter, type AP2) is recommended. Use only explosion-proof equipment; ground and bond all containers and handling equipment. See **Environmental, Health, and Physical Hazard Information**.

- **In case of fire** – Deny any unnecessary entry into the area and consider the use of unmanned hose holders. Use water spray or fog, carbon-dioxide or dry-chemical extinguishers, or foam to fight the fire. Use of a direct water stream may spread the fire. Firefighters should wear positive-pressure, self-contained breathing apparatus (SCBA) and protective firefighting clothing. The public should be warned of downwind vapor explosion hazards. Vapors are heavier than air and may travel a long distance and accumulate in low-lying areas. Keep vapors out of sewers. Immediately withdraw all personnel from the area in case of rising sounds from venting safety device or discolorations of the container. Keep fire water out of waterways and sewers to minimize the potential for environmental damage. Follow emergency procedures carefully. See **Environmental, Health, and Physical Hazard Information**.

For more information, request the relevant Safety Data Sheet from the Dow Customer Information Group.

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**Health Information**

Health information for glutaraldehyde-containing products is summarized on the relevant Safety Data Sheets. It is important to note that health risks associated with individual products may vary based on their formulation or intended use. The Safety Data Sheet is the preferred source for specific health information. These materials may also contain minor components or additives that have additional health risks. An overview of health information for glutaraldehyde appears below.

**Eye contact** – Contact may cause severe irritation with corneal injury, which may result in permanent impairment of vision, even blindness. Chemical burns may occur. Vapor may cause eye irritation experienced as mild discomfort and redness.

**Skin contact** – Brief contact may cause skin burns. Symptoms may include pain, severe local redness, and tissue damage.

**Inhalation** – Vapor may cause severe irritation of the upper respiratory tract (nose and throat). Vapor from heated material may cause serious adverse effects, even death. Case reports and medical surveys link asthma and respiratory irritation to glutaraldehyde exposure, primarily in medical personnel. Asthma-like symptoms may occur in people prone to respiratory disorders or other allergies. Asthma-like symptoms may include coughing, difficult breathing, and a feeling of tightness in the chest. Occasionally, breathing difficulties may be life threatening.

**Respiratory sensitization** – May cause allergic respiratory response in a small proportion of individuals.

**Ingestion** – This material has moderate toxicity if swallowed. Swallowing may result in irritation or burns of the mouth, throat, and gastrointestinal tract. Swallowing may result in gastrointestinal irritation or ulceration. Excessive exposure may cause headache, dizziness, anesthetic effects, drowsiness, unconsciousness, and other central nervous system effects.

**Aspiration hazard** – Aspiration into the lungs may occur during ingestion or vomiting, causing tissue damage or lung injury.

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Repeated exposure – Repeated skin contact may cause nausea and vomiting, and may result in absorption of amounts that could cause death.

Other – This material has been toxic to the fetus in laboratory animals at doses toxic to the mother.

For more information, request the relevant Safety Data Sheet from the Dow Customer Information Group.

Environmental Information\textsuperscript{17,18}
Glutaraldehyde is readily biodegradable in soil, fresh water, and seawater (per OECD 301 screening guidelines, showing more that than 60% of the material biodegrades over a 28-day period when exposed to the typical environmental conditions, including exposure to certain microorganisms). This material has low potential for bioconcentration; it is not likely accumulate in the food chain. Glutaraldehyde is highly toxic (US classification) / very toxic (EU classification) ($LC_{50}/EC_{50}$ between 0.1 and 1 mg/L) to aquatic organisms on an acute basis.

For more information, request the relevant Safety Data Sheet from the Dow Customer Information Group.

Physical Hazard Information\textsuperscript{19}
Glutaraldehyde is thermally stable under recommended storage and normal use conditions, but can decompose at elevated temperatures. Decomposition products depend on temperature, air supply, and the presence of other materials. Avoid contact with amines, ammonia, strong acids, strong bases, and strong oxidizers, as well as metals such as aluminum, carbon steel, copper, iron, and mild steel.

For more information, request the relevant Safety Data Sheet from the Dow Customer Information Group.

Regulatory Information
Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of glutaraldehyde. Information may be found by consulting the relevant Safety Data Sheet or Contact Us.

Additional Information
- Safety Data Sheet (www.dow.com/webapps/msds/msdssearch.aspx)
- Contact Us (www.dow.com/microbial/contact/index.htm)
- Dow Microbial Control website (www.dow.com/microbial/index.htm)
- Dow Glutaraldehyde Information website (http://www.glutaraldehyde.com)

For more business information about glutaraldehyde, visit the Dow Microbial Control business web site at www.dow.com/microbial/index.htm.
References

1. AQUACAR™ 50 Water Treatment Microbiocide, BIOBAN™ 50 Antimicrobial, and Glutaraldehyde 50% Material Safety Data Sheets, The Dow Chemical Company, Hazards Identification.
5. AQUACAR™ 50 Water Treatment Microbiocide, BIOBAN™ 50 Antimicrobial, and Glutaraldehyde 50% Material Safety Data Sheets, The Dow Chemical Company, Hazards Identification.
7. AQUACAR™ 50 Water Treatment Microbiocide, BIOBAN™ 50 Antimicrobial, and Glutaraldehyde 50% Material Safety Data Sheets, The Dow Chemical Company, Ecological Information.
8. AQUACAR™ 50 Water Treatment Microbiocide, BIOBAN™ 50 Antimicrobial, and Glutaraldehyde 50% Material Safety Data Sheets, The Dow Chemical Company, Stability and Reactivity.
10. AQUACAR™ 50 Water Treatment Microbiocide, BIOBAN™ 50 Antimicrobial, and Glutaraldehyde 50% Material Safety Data Sheets, The Dow Chemical Company, Hazards Identification.
13. Estimates by The Dow Chemical Company.
16. AQUACAR™ 50 Water Treatment Microbiocide, BIOBAN™ 50 Antimicrobial, and Glutaraldehyde 50% Material Safety Data Sheets, The Dow Chemical Company, Hazards Identification.
18. AQUACAR™ 50 Water Treatment Microbiocide, BIOBAN™ 50 Antimicrobial, and Glutaraldehyde 50% Material Safety Data Sheets, The Dow Chemical Company, Ecological Information.
NOTICES

As part of its 2015 Sustainability Goals, Dow has committed to make publicly available safety assessments for its products globally. This product safety assessment is intended to give general information about the chemical (or categories of chemicals) addressed. It is not intended to provide an in-depth discussion of health and safety information. Additional information is available through the relevant Safety Data Sheet, which should be consulted before use of the chemical. This product safety assessment does not replace required communication documents such as the Safety Data Sheet.

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