Spills, Deactivation and Disposal of Glutaraldehyde
Safe Use and Handling Guide

Prompt and appropriate attention to drips, splashes, and spills is important to reduce the potential for unnecessary exposure. When handling glutaraldehyde, Dow recommends maintaining vapor exposure levels at or below 0.05 parts per million.¹

Avoid making contact with spilled material, taking care not to step in spills since glutaraldehyde will be absorbed by most shoes. When cleaning up a spill, always wear the appropriate protective equipment, including respiratory protection, gloves and protective clothing. Depending on the size of the spill, the adequacy of ventilation and the ability to determine exposure concentrations, a self-contained breathing apparatus may be required. For smaller spills, the use of a full-face air-purifying respirator equipped with organic vapor cartridges with a particulate pre-filter may be considered, if exposure concentrations are known.

Spill Containment Plan
A spill containment plan for glutaraldehyde should be in place and should include training programs for emergency personnel, easy access to equipment for cleaning up a spill, as well as procedures for alerting personnel, avoiding glutaraldehyde contact, and, if necessary, evacuating non-essential personnel until the spill has been neutralized and disposed of. Type of ventilation, air turnover rate, the size and temperature of the room, and the quantity spilled are important considerations.

Cleanup of Spills

**Small Spills**
To clean up small spills, wear the correct protective equipment and cover the liquid with absorbent material. Collect and seal the material in polyethylene bags and place in a drum for transit to an approved disposal site.

Dirt that has absorbed the spilled material should also be collected and similarly disposed of. The remaining spilled material may be rinsed away with water to reduce odor; however, it is important to ensure that the rinsate is discharged into a municipal or industrial sewer, not into a natural waterway.

**Large Spills**
Large spills that cause nasal and respiratory irritation indicate that the area should be evacuated and cleaned up by a trained team. The appropriate safety and governmental personnel should be notified immediately as appropriate. If tearing of the eyes and nasal or respiratory irritation occur with a spill, then the room ventilation is inadequate to handle the spill. The room should be vacated immediately until a team equipped to handle a larger spill is on the scene. Personnel cleaning up a larger spill should be trained and equipped with a self-contained breathing apparatus, or, if not available, an officially approved or certified full-face air-purifying respirator equipped with organic vapor cartridges with a particulate pre-filter. They should also wear gloves and clothing impervious to glutaraldehyde, including rubber boots or shoe protection.
Deactivation
Pour an appropriate deactivation compound (see below) into the spilled glutaraldehyde. Collect the neutralized liquid and, if appropriate, flush it down the drain with large amounts of fresh water. Depending on the quantity spilled, absorbents may be needed. Large spills should be contained and deactivated before disposal. Although the methods listed below will deactivate glutaraldehyde, there may be other components present in a particular formulation that must also be considered before effective and safe cleanup is initiated. Please consult the manufacturer of the other chemical components in the formulation for further details and precautions.

The following table illustrates the amounts of sodium bisulfite (SBS, NaHSO₃, CAS # 7631-90-5) needed for different concentrations of glutaraldehyde:

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<th>Water Volume, gal (L)</th>
<th>Glutaraldehyde Active Level, ppm</th>
<th>SBS Required, oz (g)</th>
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<tr>
<td>100 (380)</td>
<td>20</td>
<td>0.53–0.8 (15–23)</td>
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<tr>
<td>500 (1900)</td>
<td>100</td>
<td>13.3–20 (380–570)</td>
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<tr>
<td>5 (19)</td>
<td>20,000 (2%)</td>
<td>26.7–40 (760–1140)</td>
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Note: Sodium Bisulfite or SBS reacts readily with other aldehydes and ketones. If other aldehydes or ketones are present, more SBS may be necessary for complete deactivation. There may be other components present in your solution that will not be deactivated by SBS. Sodium metabisulfite (Na₂S₂O₅, CAS # 7681-57-4) is commonly used as a substitute for SBS and will even work in this case, but has the added disadvantage of releasing sulfur dioxide when dissolved in water. It is recommended to use sodium bisulfite.

Disposal

Disposal of Concentrate
Glutaraldehyde-based solutions should not be discharged into lakes, streams, ponds, estuaries, oceans, or other waters unless in accordance with local regulatory procedures, e.g., National Pollutant Discharge Elimination Systems (NPDES) permit. Do not discharge effluent containing glutaraldehyde to sewer systems without previously notifying the local sewage treatment plant authority. For guidance, contact your Local Water Board, Regional Office of the Environmental Protection Agency, or appropriate regulatory authority. In unusual circumstances, when you have large quantities of concentrated glutaraldehyde to dispose of (those containing greater than 5% active), high-temperature incineration is an acceptable practice.

Under these conditions, glutaraldehyde burns cleanly to carbon dioxide and water.

Disposal of Glutaraldehyde Solutions
Two environmentally acceptable methods exist for disposing of solutions of glutaraldehyde.

• Dilution
The simpler method involves further dilution to an essentially non microbiocidal concentration (less than 5 ppm active) in order to allow the glutaraldehyde to biodegrade.

With Sodium Hydroxide (Caustic Soda)
Glutaraldehyde concentrations up to 2% active may be deactivated by the addition of aqueous sodium hydroxide (caustic soda). Adding a sufficient amount of sodium hydroxide solution to maintain a pH of 12 will reduce the concentration of glutaraldehyde to approximately 20 ppm or less within 8 hours at room temperature. Maintaining the pH at 12 or higher is critical, as a lower pH will result in a significantly slower deactivation of glutaraldehyde. The treated solutions, which now contain a low level of residual glutaraldehyde, should be returned to neutral pH by the careful addition of an inorganic acid, e.g., hydrochloric acid, before disposal by appropriate means.

• Chemical Inactivation
The second procedure requires chemical inactivation with sodium hydroxide prior to disposal using the previously described deactivation method.

Bio-oxidation of Glutaraldehyde
In the laboratory, the potential for a chemical to biodegrade is often measured by the Biochemical Oxygen Demand (BOD) test. This standard test involves exposing a test material to non-acclimated sewage microorganisms and measuring the oxygen demand of the system. Calculations of percent bio-oxidation are correlated to the amount of oxygen required to degrade the chemical completely to carbon dioxide and water. In a standard BOD test, more than 50% of glutaraldehyde is degraded in less than ten days.

In tests with sewage microorganisms, the No Observed Effect Concentration (NOEC) for glutaraldehyde to domestic sewage microorganisms in an OECD 209 respiratory inhibition study was 16 ppm. Thus, with appropriate dilution glutaraldehyde can be effectively treated in a waste water treatment plant, WWTP.
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Genuine Glutaraldehyde

The recommendations in this Safe Use and Handling Guide apply to glutaraldehyde sourced from Dow, a supplier of GENUINE GLUTARALDEHYDE.

In the more than six decades since glutaraldehyde was introduced to the marketplace, it has become known as a versatile molecule. Today, non-genuine products, mixed with less-effective “aldehydes” such as formaldehyde or glyoxal, but labeled deceptively as glutaraldehyde, are available in the marketplace all over the world.

Risks are potentially high for workers and the environment when mislabeled chemicals, especially ones containing carcinogens, are unknowingly handled. GENUINE GLUTARALDEHYDE is not a carcinogen, mutagen, nor a reproductive toxicant. It does not bio accumulate and is readily biodegradable. It’s critical for companies to ensure they are using GENUINE GLUTARALDEHYDE to comply with approved safe handling guidelines. Non-genuine products may have significantly different toxicological properties that can harm workers and the environment and have been proven to fall short in efficacy and sustainability.

The Dow Chemical Company has developed and validated new analytical methods to help customers distinguish GENUINE GLUTARALDEHYDE from non-genuine products that are labeled incorrectly as “glutaraldehyde”. These methods include an innovative, field-deployable, and easy to use test-kit that provides a rapid detection method.

For more information, visit www.glutaraldehyde.com.

Product Stewardship

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products - from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. When considering the use of any Dow product in a particular application, review the latest Safety Data Sheet (SDS) and country-specific product label to ensure the intended use is within the scope of approved uses and can be accomplished safely. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including SDS’s, should be consulted prior to use of Dow products. Current SDS’s are available from Dow.

Before handling any of the products mentioned herein consult the product’s SDS for details on product hazards, recommended handling precautions, product storage and disposal.

Footnotes

1. For many substances, the exposure limit is expressed as a time-weighted average over an eight-hour working day (TWA8). For others, it is expressed as a TWA qualified by a short-term exposure limit (STEL), which is a 15-minute TWA that should not be exceeded at any time. The American Conference of Governmental Industrial Hygienist recommends that exposures above the TWA8 up to the STEL should not be longer than 15 minutes and should not occur more than four times per day. There should be at least 60 minutes between successive exposures in this range. Where the exposure limit may be expressed as a ceiling limit, this value should not be exceeded at any time during the workday.
**For more information contact us:**

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