

Candidate Disinfectants for Research International Products ⁽¹⁾

Introduction

To minimize carry-over contamination from run-to-run, it is necessary that an effective cleaning procedure be developed based on the disinfectant of choice or necessity.

Disinfectant effectiveness depends on many factors. These include:

- Type of contaminating microorganism or substance – It is more difficult to remove or destroy residual nucleic acids than to kill the microbes those nucleic acids resided in (see also Appendix 1).
- Degree of contamination – This determines the quality of disinfectant required and time of exposure.
- Chemical nature of disinfectant – It is important to understand the mode of action in order to select the appropriate disinfectant.
- Contact time and temperature – Sufficient time and appropriate temperature must be allowed for action of the disinfectant and may depend on the degree of contamination and organic matter load.
- Concentration and quantity of disinfectant – It is important to choose the proper concentration and quantity of disinfectant best suited to each situation. RI can make general recommendations, but it is often best to develop a custom procedure that reflects the specific application and what levels of carry-over are important.
- Amount of proteinaceous material present – High protein based materials absorb and neutralize some chemical disinfectants.
- Presence of organic matter and other compounds such as soaps may neutralize some disinfectants.
- Residual activity and their effect on plastics and metals should be considered. Residues may also generate false negative results in subsequent tests.
- Application temperature, pH and interactions with other compounds must be considered.
- Relative safety to people that may be exposed.

Notes:

1. Selected excerpts from the British Columbia Centre for Disease Control's Brochure, "*Selection and use of Disinfectants.*" The entire document can be reviewed on their web site at www.bccdc.ca.

Research International's air samplers are generally compatible with at least short exposures to:

- Detergents,
- Ethyl and isopropyl alcohols,
- Hypochlorite solutions,
- Hydrogen peroxide,
- Ethylene oxide, and
- Formaldehyde
- The top half of the SASS 3010 may be steam sterilized at 121°C

Some disinfectants such as hypochlorite solution are corrosive towards aluminum and other metals, but practically, corrosion is negligible as long as the disinfecting agent is flushed out well or not left in the device for several hours.

Most disinfectants are potentially hazardous. Hypochlorite solutions can release chlorine when mixed with acid; hydrogen peroxide can damage eye membranes; ethylene oxide is flammable and toxic; and formaldehyde is toxic and carcinogenic. The following material is provided as a starting point from which to develop a decontamination protocol that meets your specific needs.



CAUTION: Air samplers process large amounts of air. Volatile and potentially health-threatening components of a disinfecting solution can be rapidly extracted and discharged into surrounding air by an operating sampler.

1.0 Intermediate Level Disinfectants

1.1 Alcohols

In the healthcare setting, "alcohol" refers to two water-soluble chemicals: ethyl alcohol and isopropyl alcohol. These alcohols are rapidly bactericidal rather than bacteriostatic against vegetative forms of bacteria (Gram + and Gram -); they also are tuberculocidal, fungicidal, and virucidal against enveloped viruses. Alcohols are not effective against bacterial spores and have limited effectiveness against nonenveloped viruses. Their cidal activity drops sharply when diluted below 50% concentration and the optimum bactericidal concentration is in the range of 60-90% solutions in water (volume/volume). The antimicrobial activity of alcohols can be attributed to their ability to denature proteins. Higher concentrations are less effective as the action of denaturing proteins is inhibited without the presence of water.

Alcohols are commonly used as topical antiseptics. They are also used to disinfect the surface of medical equipment. Alcohols require time to work and they may not penetrate organic material. The shortcoming of alcohols with respect to Research International's instruments are their tendency to cause rubber and certain plastic tubing to swell and harden

after prolonged and repeated use. Alcohols are flammable and consequently must be stored in a cool, well-ventilated area. They also evaporate rapidly making extended exposure time difficult to achieve unless the items are immersed. Alcohol irritates tissues.

The use of either ethyl alcohol or isopropyl alcohol in a 60-90% solution has recently gained wide acceptance in health care settings as hand antiseptics. They can be used as a reasonable substitute for hand washing as long as hands are not visibly soiled. The drying effect of alcohols on the hands can be counteracted with the addition of emollients and skin conditioning agents to the formulation. Further study is needed to determine the ideal formulation of alcohol based hand antiseptics for effectiveness.

1.2 Hypochlorites

Hypochlorites are the most widely used of the chlorine disinfectants and are available in a liquid (e.g. sodium hypochlorite) or solid (e.g. calcium hypochlorite, sodium dichloroisocyanurate) form. The most common chlorine products in are aqueous solutions of 4 to 6% sodium hypochlorite, which are readily available as "household bleach". They have a broad spectrum of antimicrobial activity, are unaffected by water hardness, are inexpensive and fast acting, and have a low incidence of serious toxicity. The exact method by which free chlorine destroys microorganisms has not been elucidated. Sodium hypochlorite at the concentration used in household bleach (4-6%) may produce skin and ocular irritation or oropharyngeal, esophageal, and gastric burns. Other disadvantages of hypochlorites include corrosiveness to metals in high concentrations (>500 ppm), inactivation by organic matter, discoloring or "bleaching" of fabrics, and release of toxic chlorine gas when mixed with ammonia or acid.

Hypochlorites can eliminate both enveloped and nonenveloped viruses if used in correct dilution and contact time. They are also effective against fungi, bacteria, and algae but not spores. Household bleach is typically diluted using 1:50 with water (1000ppm) for surface disinfection. Bleach solutions have been recommended for use in both hospitals and the community as disinfecting solutions. They are included in most recommendations for decontamination of hepatitis and AIDS viruses. Hypochlorites are also the agent of choice in disinfecting surfaces used for food preparation or in bathrooms. Organic material such as feces or blood inactivate chlorine based disinfectants, therefore, surfaces must be clean before their use. In order to obtain maximum effectiveness with chlorine based disinfectants they must remain in contact with surfaces for several minutes. Chlorine based disinfectants diluted in tap water have a limited shelf life. After 30 days such solutions stored in a polyethylene container will lose 40-50% of their concentration. Ideally solutions used for surface disinfection should be mixed fresh to ensure adequate levels of chlorine for antimicrobial activity.

1.3 Iodine and Iodophor Disinfectants

Iodine and iodophors are well-established chemical disinfectants. These compounds have been incorporated in time release formulations and in soaps (surgical scrubs). Simple iodine tinctures (dissolved in alcohol) have limited cleaning ability. These compounds are bactericidal, sporicidal, virucidal and fungicidal but require a prolonged contact time. The disinfective ability of iodine, like chlorine, is neutralized in the presence of organic material

and hence frequent applications are needed for thorough disinfection. Iodine tinctures can be very irritating to tissues, can stain fabric and be corrosive. "Tamed" iodines such as surgical scrubs and surgical antiseptics generally do not irritate tissues. Besides their use as an antiseptic, iodophors have been used for the disinfection of blood culture bottles and medical equipment such as hydrotherapy tanks, thermometers, and endoscopes. Antiseptic iodophor preparations are not suitable for use as hard-surface disinfectants because of concentration differences. Iodophors formulated as antiseptics contain less free iodine than those formulated as disinfectants.

2.0 HIGH LEVEL DISINFECTANTS

2.1 Hydrogen Peroxide

Peroxides such as hydrogen peroxide are often used as antiseptics to clean wounds. The activity of peroxides is greatest against anaerobic bacteria. Hydrogen peroxide at high concentrations is in some cases is damaging to tissues, resulting in a prolonged healing time. It is useful for cleaning surgical sites after closure, but must be used sparingly to avoid penetrating suture lines, which would inhibit healing.

Stabilized hydrogen peroxides can be used to disinfect environmental surfaces. The literature contains several accounts of the properties, germicidal effectiveness, and potential uses for stabilized hydrogen peroxide in the hospital setting. Stabilized hydrogen peroxides are effective against a broad range of pathogens including both enveloped and nonenveloped viruses, vegetative bacteria, fungi and bacterial spores. Manufacturer's findings demonstrate that this solution sterilizes in 30 minutes and provides high-level disinfection in 5 minutes. This product has not been used long enough to evaluate material compatibility to endoscopes and other semicritical devices, and further assessment by instrument manufacturers should be done.

Stabilized peroxides may also be blended with iodophors or quaternary ammonia. Hydrogen peroxide is also blended with peracetic acid in high concentrations for use as a high-level disinfectant.

2.2 Gluteraldehyde

Aldehydes have a wide germicidal spectrum. Gluteraldehydes are bactericidal, virucidal, fungicidal, sporicidal and parasiticidal. They are used as a disinfectant or sterilant in both liquid and gaseous forms. They have moderate residual activity and are effective in the presence of limited amounts of organic material. Gluteraldehydes are very potent disinfectants, which can be highly toxic. Use them only as a last resort and then under trained supervision in a well-ventilated setting and with appropriate personal protective equipment.

2.3 Formaldehyde

Formaldehyde is used as a disinfectant and sterilant both in the liquid and gaseous states. Formaldehyde is sold and used principally as a water-based solution called formalin, which is 37% formaldehyde by weight. The aqueous solution is bactericidal, tuberculocidal, fungicidal, virucidal and sporicidal.



Formaldehyde should be handled in the workplace as a potential carcinogen with an employee exposure standard that limits an 8-hour time-weighted average exposure to a concentration of 0.75 ppm. For this reason, employees should have limited direct contact with formaldehyde and these considerations limit its role in sterilization and disinfection processes.

A wide range of microorganisms is destroyed by varying concentrations of aqueous formaldehyde solutions. Although formaldehyde-alcohol is a chemical sterilant and formaldehyde is a high-level disinfectant, the hospital uses of formaldehyde are limited by its irritating fumes and the pungent odor that is apparent at very low levels (<1 ppm).

2.4 Ortho-phthalaldehyde

Ortho-phthalaldehyde (OPA) is a chemical sterilant similar to glutaraldehyde with similar antimicrobial activity. OPA has several potential advantages compared to glutaraldehyde. It has excellent stability over a wide pH range (pH 3-9), is not a known irritant to the eyes and nasal passages, does not require exposure monitoring, has a barely perceptible odor, and requires no activation. OPA, like glutaraldehyde, has excellent material compatibility. A potential disadvantage of OPA is that it stains proteins gray (including unprotected skin) and thus must be handled with caution. However, skin staining would indicate improper handling that requires additional training and/or personal protective equipment (PPE) (gloves, eye and mouth protection, fluid-resistant gowns). Although OPA does not smell, PPE should be worn when handling contaminated instruments, equipment, and chemicals and good ventilation should be provided. In addition, equipment must be thoroughly rinsed to prevent discoloration of a patient's skin or mucous membrane.

2.5 Peracetic Acid

Peracetic, or peroxyacetic, acid is characterized by a very rapid action against all microorganisms. A special advantage of peracetic acid is it has no harmful decomposition products (i.e., acetic acid, water, oxygen, hydrogen peroxide) and leaves no residue. It remains effective in the presence of organic matter and is sporicidal even at low temperatures. Peracetic acid can corrode copper, brass, bronze, plain steel, and galvanized iron but these effects can be reduced by additives and pH modifications. It is considered unstable, particularly when diluted; for example, a 1% solution loses half its strength through hydrolysis in 6 days, whereas 40% peracetic acid loses 1 to 2% of its active ingredients per

month. It is used in automated machines to chemically sterilize medical, surgical, and dental instruments (e.g., endoscopes, arthroscopes).

2.6 Peracetic Acid and Hydrogen Peroxide

Two chemical sterilants are available that contain peracetic acid plus hydrogen peroxide (0.08 peracetic acid plus 1.0% hydrogen peroxide [no longer marketed], 0.23% peracetic acid plus 7.35% hydrogen peroxide). The bactericidal properties of peracetic acid and hydrogen peroxide have been established. Manufacturer's findings demonstrated that this product inactivated all microorganisms with the exception of bacterial spores within 20 minutes. The combination of peracetic acid and hydrogen peroxide has been used for disinfecting hemodialyzers.

3.0 APPENDICES

Appendix 1 – Classes of Organisms Ranked in Order of Susceptibility to Disinfectants

Bacteria with Spores (*B. subtilis*, *C. tetani*, *C. difficile*, *C. botulinum*)
Protozoa with Cysts (*Giardia lamblia*, *Cryptosporidium parvum*)

Mycobacteria (*M. tuberculosis*, *M. avium-intracellulare*, *M. chelonae*)

Non-Enveloped Viruses (Coxsackievirus, poliovirus, rhinovirus, Norwalk-like Virus, hepatitis A virus)

Fungi (*Candida* species, *Cryptococcus* species, *Aspergillus* species, Dermatophytes)

Vegetative Bacteria (*Staphylococcus aureus*, *Salmonella typhi*, *Pseudomonas aeruginosa*, coliforms)

Enveloped Viruses (Herpes simplex, varicella-zoster virus, cytomegalovirus, measles virus, mumps virus, rubella virus, influenza virus, influenza virus, respiratory syncytial virus, hepatitis B & C viruses, hantavirus and human immunodeficiency virus)

Appendix 2 – Selection and Use of Disinfectants

Disinfectant	Uses	Advantages	Disadvantages
<p>Alcohols</p> <ul style="list-style-type: none"> ▪ See Ethyl Alcohol MSDS on page 13 ▪ See Isopropyl Alcohol MSDS on page 20 	<p>Intermediate level disinfectant.</p> <p>Disinfect thermometers, external surfaces of some equipment (e.g., stethoscopes).</p> <p>Equipment used for home health care.</p> <p>Used as a skin antiseptic.</p>	<p>Fast acting.</p> <p>No residue.</p> <p>Non staining.</p>	<p>Volatile.</p> <p>Evaporation may diminish concentration.</p> <p>May harden rubber or cause deterioration of glues.</p> <p>Intoxicating.</p>
<p>Chlorine</p> <ul style="list-style-type: none"> ▪ See MSDS on page 27 	<p>Intermediate level disinfectant.</p> <p>Disinfect hydrotherapy tanks, dialysis equipment, cardiopulmonary training manikins, environmental surfaces.</p> <p>Effective disinfectant following blood spills; aqueous solutions (5,000 ppm /1:10 bleach) used to decontaminate area after blood has been removed; sodium dichloroisocyanurate powder sprinkled directly on blood spills for decontamination and subsequent cleanup.</p> <p>Equipment used for home health care. Undiluted bleach can be used as a high level disinfectant.</p>	<p>Low cost.</p> <p>Fast acting.</p> <p>Readily available in non-hospital settings.</p>	<p>Corrosive to metals.</p> <p>Inactivated by organic material.</p> <p>Irritant to skin and mucous membranes.</p> <p>Use in well-ventilated areas.</p> <p>Shelf life shortens when diluted (1:9 parts water)</p>

<p>Formaldehyde</p> <ul style="list-style-type: none"> ▪ See MSDS on page 36 	<p>Very limited use as chemisterilant.</p> <p>Sometimes used to reprocess hemodialyzers.</p> <p>Gaseous form used to decontaminate laboratory safety cabinets.</p>	<p>Active in presence of organic materials.</p>	<p>Carcinogenic.</p> <p>Toxic.</p> <p>Strong irritant.</p> <p>Pungent odor.</p>
<p>Ortho-phthalaldehyde (OPA-0.55% solution)</p> <ul style="list-style-type: none"> ▪ See MSDS on page 44 	<p>Superior mycobactericidal activity, acts within 5 minutes. When tested against a wide range of microorganisms, OPA showed good activity.</p>	<p>Shorter process time (12min); No activation. Not a known irritant to eyes and nasal passages. No vapor ceiling limit. Weak odor.</p>	<p>Stains protein gray; not 100% sporicidal; Higher cost.</p>
<p>Hydrogen peroxide gas plasma</p> <ul style="list-style-type: none"> ▪ MSDS Not Available 	<p>45 min. cycle time.</p> <p>Clean room sterilization, broad spectrum sterilization.</p>	<p>Very effective sterilization process.</p> <p>Leaves no toxic residues.</p>	<p>Capital equipment cost.</p> <p>New technology - May be less effective for pathogens buried in a thin organic film; most suited for dry objects.</p>
<p>Ethylene oxide gas (ETO)</p> <ul style="list-style-type: none"> ▪ See MSDS on page 51 	<p>Sterilization of large batches of temperature-sensitive hospital supplies; 30-50C, 2 to 8 hrs, 40-50% RH typical.</p>	<p>Used since the 1950s.</p> <p>Effective at penetrating small orifices/channels.</p> <p>Effective for viruses, bacteria and spores.</p>	<p>Capital equipment cost. Gas is extreme irritant and flammable. Gas must be vented before exposure to personnel.</p>

<p>Glutaraldehydes</p> <ul style="list-style-type: none"> ▪ See MSDS on page 57 	<p>2% formulations — high level disinfection for heat sensitive equipment.</p> <p>Most commonly used for endoscopes, respiratory therapy equipment and anesthesia equipment.</p>	<p>Noncorrosive to metal.</p> <p>Active in presence of organic material.</p> <p>Compatible with lensed instruments.</p> <p>Sterilization may be accomplished in 6-10 hours.</p>	<p>Extremely irritating and toxic to skin and mucous membranes.</p> <p>Shelf life shortens when diluted (effective for 14-30 days depending on formulation).</p> <p>High cost.</p> <p>Monitor concentration in reusable solutions.</p>
<p>Hydrogen Peroxide liquid</p> <ul style="list-style-type: none"> ▪ See MSDS on page 64 	<p>Low level disinfectant (3%).</p> <p>Equipment used for home health care.</p> <p>Cleans floors, walls and furnishings.</p> <p>High level disinfectant (6%).</p> <p>Effective for high level disinfection of flexible endoscopes.</p> <p>Foot care equipment.</p> <p>Disinfection of soft contact lenses.</p> <p>Higher concentrations used as chemisterilants in specially designed machines for decontamination of heat sensitive medical devices.</p> <p>Stabilized hydrogen peroxide (0.5%) is used a high level surface disinfectant.</p>	<p>Strong oxidant.</p> <p>Fast acting.</p> <p>Breaks down into water and oxygen.</p>	<p>Can be corrosive to aluminum, copper, brass or zinc.</p> <p>Surface active with limited ability to penetrate.</p>

Sources:

Handwashing, Cleaning, Disinfection and Sterilization in Health Care. CCDR 24S8, December 1998: Health Canada, and W. Rutal and D. Weber, *New Disinfection and Sterilization Methods*, Emerging Infectious Diseases, Vol. 7, No. 2, Mar-April 2001, U.S. CDC.

Hydrogen Peroxide Grades

3% Hydrogen Peroxide (Drug/Grocery Store Variety)

Used as antimicrobial agent for treating wounds and sanitizing agent
[Made from 50% Super D Peroxide, Diluted. Contains stabilizers - phenol, acetanilide, sodium stannate, tetrasodium phosphate among them. Do not ingest.

6% Hydrogen Peroxide

Used by Beauticians for Coloring Hair. Used as sanitizing agent.
Comes in strengths labeled 10,20,40 volume. Must have activator added to be used as a bleach. Contains stabilizers, additives, and impurities dependent on manufacturing and dilution process. Do not ingest.

30% Reagent Hydrogen Peroxide

Used in medical research. Contains stabilizers, additives, and impurities dependent on manufacturing and dilution process. Do not ingest.

30-32% Electronic Grade Hydrogen Peroxide

Used for washing transistors and integrated chip parts before assembly. Contains stabilizers, additives, and impurities dependent on manufacturing and dilution process. Do not ingest.

35% Food Grade Hydrogen Peroxide (Also 50% Food Grade H₂O₂)

Also used to spray inside of foil lined containers for food storage - known as the aseptic packaging system. Contains stabilizers, additives, and impurities dependent on manufacturing and dilution process. This Food Grade Hydrogen Peroxide is Stabilized using tin based formulations.

35% Technical Grade Hydrogen Peroxide

Used for wastewater treatment and the disinfection of potable water, cosmetics, and laundry applications. [May contain a small amount of phosphorus to neutralize any chlorine in the water it is combined with.]

35% Standard Grade Hydrogen Peroxide (Also 50%, 60%, 70% Standard Grades)

Used mainly for bleaching in the pulp and paper industry and in the textile industry; oxidation reactions in the chemical industry; environmental processes (detoxification and deodorization). Used for wastewater treatment. Contains stabilizers, additives, and impurities. Do not ingest.

90% Hydrogen Peroxide

Used by the military as a source of oxygen for rocket propulsion.

Intentional Additives to Hydrogen Peroxide and Impurities	
Additives	Purpose
Tin (Stannate)	Stabilizes product against decomposition caused by heavy metals
Phosphate	Stabilizes product against decomposition caused by chlorine or heavy metals
Nitrate	Acts as an inhibitor against the corrosion of aluminum
Impurities	Source
Carbon	Organic contamination from the "working solution" or anthraquinone
Aluminum	From contact with metallic process equipment and piping
Chloride	From plant water supply
Sulfate	From plant water supply
Ammonium	From plant water supply or degradation of organic amines

TECHNICAL DATA SECTION

MATERIAL SAFETY DATA SHEETS

Burdick & Jackson

Material Safety Data Sheet

Ethyl Alcohol, Reagent, Anhydrous

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Ethyl Alcohol, Reagent, Anhydrous

OTHER/GENERIC NAMES: Ethyl alcohol, Denatured alcohol

PRODUCT USE: Solvent

MANUFACTURER: Honeywell, Burdick & Jackson
1953 South Harvey Street
Muskegon, MI 49442

FOR MORE INFORMATION CALL:

(Monday-Friday, 8:00am-5:00pm)

1-800-368-0050

IN CASE OF EMERGENCY CALL:

(24 Hours/Day, 7 Days/Week)

1-800-707-4555 or Chemtrec 1-800-424-9300

2. COMPOSITION/INFORMATION ON INGREDIENTS

<u>INGREDIENT NAME</u>	<u>CAS NUMBER</u>	<u>WEIGHT %</u>
Ethyl Alcohol	64-17-5	~90%
Methanol	67-56-1	~5%
Isopropyl Alcohol	67-63-0	~5%

Trace impurities and additional material names not listed above may also appear in Section 15 toward the end of the MSDS. These materials may be listed for local "Right-To-Know" compliance and for other reasons.

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Extremely flammable liquid and vapor. Clear colorless liquid. Mildly toxic by inhalation, ingestion and skin contact. Cannot be made non-poisonous.

POTENTIAL HEALTH HAZARDS

SKIN: Irritant. May cause dermatitis through defatting of the skin.

EYES: Irritant. Redness and itching may result from exposure to vapors or liquid.

INHALATION: Can cause headache, drowsiness, intoxication, visual impairment, blindness, coma and death.

INGESTION: Can cause gastrointestinal disorder, central nervous system depression, headache, drowsiness, intoxication, visual impairment, blindness, coma and death

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MATERIAL SAFETY DATA SHEET

Ethyl Alcohol, Reagent, Anhydrous

DELAYED EFFECTS: Prolonged or repeated exposure can result in alcoholism, cyanosis, respiratory failure and liver damage.

Ingredients found on one of the OSHA designated carcinogen lists are listed below.

<u>INGREDIENT NAME</u>	<u>NTP STATUS</u>	<u>IARC STATUS</u>	<u>OSHA LIST</u>
Isopropyl Alcohol		Group 3, Unclassifiable	

Ethanol is classified by ACGIH as A4, not classifiable as a Human Carcinogen

4. FIRST AID MEASURES

SKIN: Rinse affected area thoroughly with water until no evidence of chemical remains.

EYES: Rinse with plenty of water for at least 15 minutes. Get professional medical assistance.

INHALATION: Remove from exposure area to fresh air. If victim is not breathing administer artificial respiration according to your level of training and obtain professional medical assistance immediately.

INGESTION: If patient is conscious, rinse mouth with water. Do not induce vomiting unless instructed to do so by a physician. Get immediate medical attention.

ADVICE TO PHYSICIAN: No specific instructions. Treat symptomatically.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES

FLASH POINT:	59°F (15°C)
FLASH POINT METHOD:	Closed Cup
AUTOIGNITION TEMPERATURE:	Not determined
UPPER FLAME LIMIT (volume % in air):	Not determined
LOWER FLAME LIMIT (volume % in air):	Not determined
FLAME PROPAGATION RATE (solids):	Not applicable
OSHA FLAMMABILITY CLASS:	IB

EXTINGUISHING MEDIA:

Alcohol foam, carbon dioxide, or dry chemical.

UNUSUAL FIRE AND EXPLOSION HAZARDS: May burn with an invisible flame. Fire hazard when exposed to heat, flame or oxidizers. Vapors are heavier than air and may travel a considerable distance to an ignition source and flash back. Vapor mixtures are explosive.

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MATERIAL SAFETY DATA SHEET

Ethyl Alcohol, Reagent, Anhydrous

SPECIAL FIRE FIGHTING PRECAUTIONS/INSTRUCTIONS:

Wear self-contained breathing apparatus. Do not release runoff from fire control methods to sewers or waterways. Keep fire exposed containers cool and reduce vapors with water spray.

6. ACCIDENTAL RELEASE MEASURES

IN CASE OF SPILL OR OTHER RELEASE: (Always wear recommended personal protective equipment.)

Eliminate sources of ignition. Isolate the spill area. Stop leak in a safe and practical manner. (If leak cannot be stopped easily and safely, advise trained emergency response personnel of the situation.) Using inert material (such as ground corncobs) dike the spilled solvent to prevent it from running into drains or waterways.

Spills and releases may have to be reported to Federal and/or local authorities. See Section 15 regarding reporting requirements.

7. HANDLING AND STORAGE

NORMAL HANDLING: (Always wear recommended personal protective equipment.)

Keep away from heat, open flame or other high temperature sources. Avoid contact with skin, eyes and clothing; avoid breathing vapor or mist. Use good personal hygiene and housekeeping practices.

STORAGE RECOMMENDATIONS:

Store in an area designed for storage of flammable liquids. (OSHA 29 CFR 1910.106)
Protect from physical damage. Store in a cool, dry, well-ventilated area away from ignition sources and other fire hazards.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:

Provide general or local exhaust ventilation systems to maintain airborne concentrations below permissible TLV levels. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

PERSONAL PROTECTIVE EQUIPMENT

SKIN PROTECTION:

Where liquid contact is possible impervious coveralls are recommended. To minimize the possibility in other handling and storage operations, wear appropriate PPE to include chemical resistant gloves, boots and apron.

EYE PROTECTION:

Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.

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MATERIAL SAFETY DATA SHEET

Ethyl Alcohol, Reagent, Anhydrous

RESPIRATORY PROTECTION:

Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For emergency or non-routine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

ADDITIONAL RECOMMENDATIONS:

This material should be used in close proximity to eyewash station and safety shower. Use appropriate personal hygiene after handling this material. Do not smoke in the vicinity of flammable materials.

EXPOSURE GUIDELINES

<u>INGREDIENT NAME</u>	<u>ACGIH TLV</u>	<u>OSHA PEL</u>	<u>OTHER LIMIT</u>
Ethyl Alcohol	1000 ppm	1000 ppm	none
Methyl Alcohol	200 ppm (skin)	200 ppm	250 ppm (STEL)
Isopropyl Alcohol	400 ppm	400 ppm	500 ppm (STEL)

- * = Limit established by Honeywell International, Inc.
- ** = Workplace Environmental Exposure Level (AIHA).
- *** = Biological Exposure Index (ACGIH).

OTHER EXPOSURE LIMITS FOR POTENTIAL DECOMPOSITION PRODUCTS: None

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:	Clear, Colorless
PHYSICAL STATE:	Liquid
MOLECULAR WEIGHT:	(mixture)
CHEMICAL FORMULA:	Mixture
ODOR:	Fragrant mild odor of alcohol. Threshold not determined.
SPECIFIC GRAVITY (water = 1.0):	0.78 (Ethanol)
SOLUBILITY IN WATER (weight %):	Miscible in all proportions
pH:	Not Applicable
BOILING POINT:	78.32°C (Ethanol)
MELTING POINT:	-114.1°C (Ethanol)
VAPOR PRESSURE:	44.6 mm Hg @ 20°C (Ethanol)
VAPOR DENSITY (air = 1.0):	1.6 (Ethanol)
EVAPORATION RATE:	~3 COMPARED TO: Butyl Acetate = 1
% VOLATILES:	100%
FLASH POINT:	59°F (15°C)

(Flash point method and additional flammability data are found in Section 5.)

Burdick & Jackson**MATERIAL SAFETY DATA SHEET**

Ethyl Alcohol, Reagent, Anhydrous

10. STABILITY AND REACTIVITY

NORMALLY STABLE? (CONDITIONS TO AVOID):

Stable at room temperature in closed containers under normal storage and handling conditions.

INCOMPATIBILITIES:

Strong oxidizing agents.

CONDITIONS TO AVOID:

Avoid heat, ignition sources and incompatible materials.

HAZARDOUS DECOMPOSITION PRODUCTS:

Incomplete combustion can produce toxic fumes of carbon monoxide.

HAZARDOUS POLYMERIZATION:

Not expected to occur.

11. TOXICOLOGICAL INFORMATION

IMMEDIATE (ACUTE) EFFECTS:

Oral-Rat LD₅₀:7060 mg/kg

Inhalation-Rat LC₅₀:20,000 ppm/10H

Intraperitoneal-Rat LD₅₀:3750 mg/kg

Intravenous-Rat LD₅₀:1440 mg/kg

Oral-Mouse LD₅₀:3450 mg/kg

Inhalation-Mouse LC₅₀:39 g/m³/4H

Intraperitoneal-Mouse LD₅₀:933 mg/kg

Intravenous-Mouse LD₅₀:1973 mg/kg

Subcutaneous-Mouse LD₅₀:8285 mg/kg

DELAYED (SUBCHRONIC AND CHRONIC) EFFECTS:

Exposure to concentrations over 1000 ppm may cause headache, irritation of the eyes, nose, and throat, and, if continued, drowsiness and lassitude, loss of appetite, and inability to concentrate. There is no concrete evidence that repeated exposure to vapor results in cirrhosis of the liver. Ingestion of large doses can cause alcohol poisoning. Repeated ingestions can lead to alcoholism.

OTHER DATA: None

12. ECOLOGICAL INFORMATION

Data reported is for methanol

LC₅₀ Pimephales promelas (fathead minnows) 29.4 g/L/96 hr, (28-29 days old), confidence limit = 28.5-30.4; test conditions: water temp = 25°C, dissolved oxygen = 7.3 mg/L, water hardness = 43.5 mg/L calcium carbonate, alkalinity = 46.6 calcium carbonate, tank volume = 6.3 l, additions = 5.71 V/D, pH = 7.66 (0.03) (conditions of bioassay not specified)

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MATERIAL SAFETY DATA SHEET

Ethyl Alcohol, Reagent, Anhydrous

13. DISPOSAL CONSIDERATIONS

RCRA

Is the unused product a RCRA hazardous waste if discarded? Yes

If yes, the RCRA ID number is: D001

OTHER DISPOSAL CONSIDERATIONS:

Dispose of material in accordance with all applicable local, state, and federal regulations.

The information offered here is for the product as shipped. Use and/or alterations to the product such as mixing with other materials may significantly change the characteristics of the material and alter the RCRA classification and the proper disposal method.

14. TRANSPORT INFORMATION

US DOT PROPER SHIPPING NAME:	Alcohols, flammable, toxic, n.o.s.
US DOT HAZARD CLASS:	3, 6.1, Flammable liquid, Poison
US DOT ID NUMBER:	UN1986
US DOT PACKING GROUP:	II
NA EMERGENCY RESPONSE GUIDE:	131

For additional information on shipping regulations affecting this material, contact the information number found in Section 1.

15. REGULATORY INFORMATION

TOXIC SUBSTANCES CONTROL ACT (TSCA)

TSCA INVENTORY STATUS: All ingredients listed on TSCA inventory

OTHER TSCA ISSUES: May be subject to Export Notification.

SARA TITLE III/CERCLA

"Reportable Quantities" (RQs) and/or "Threshold Planning Quantities" (TPQs) exist for the following ingredients.

<u>INGREDIENT NAME</u>	<u>SARA/CERCLA RQ (lb)</u>	<u>SARA EHS TPQ (lb)</u>
Methanol	5000 lbs.	

Spills or releases resulting in the loss of any ingredient at or above its RQ requires immediate notification to the National Response Center [(800) 424-8802] and to your Local Emergency Planning Committee.

SECTION 311 HAZARD CLASS: Acute, Fire

Burdick & Jackson

MATERIAL SAFETY DATA SHEET

Ethyl Alcohol, Reagent, Anhydrous

SARA 313 TOXIC CHEMICALS:

The following ingredients are SARA 313 "Toxic Chemicals". CAS numbers and weight percents are found in Section 2.

INGREDIENT NAME

Methyl Alcohol
Isopropyl Alcohol

COMMENT

Reporting is required only for those manufacturers using the Strong Acid Process

STATE RIGHT-TO-KNOW

In addition to the ingredients found in Section 2, the following are listed for state right-to-know purposes.

INGREDIENT NAME

No ingredients listed in this section.

WEIGHT %

COMMENT

ADDITIONAL REGULATORY INFORMATION: None

WHMIS CLASSIFICATION (CANADA): Class B, Division 2 & Class D, Division 2a

FOREIGN INVENTORY STATUS:

Not Determined

16. OTHER INFORMATION

CURRENT ISSUE DATE: June, 2000

PREVIOUS ISSUE DATE: November, 1996, January, 1998, October, 1998

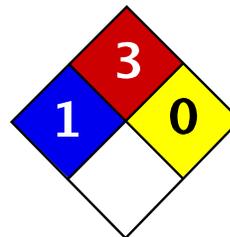
CHANGES TO MSDS FROM PREVIOUS ISSUE DATE ARE DUE TO THE FOLLOWING:

October, 1998 Update DOT info in section 14. New header and footer information.

Update to ANSI Standard. (Former, Jan, 1998)

OTHER INFORMATION:

NFPA Classification	
Health:	0
Flammability:	3
Reactivity:	0



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet Isopropyl alcohol MSDS

Section 1: Chemical Product and Company Identification

Product Name: Isopropyl alcohol

Catalog Codes: SLI1153, SLI1579, SLI1906, SLI1246, SLI1432

CAS#: 67-63-0

RTECS: NT8050000

TSCA: TSCA 8(b) inventory: Isopropyl alcohol

CI#: Not available.

Synonym: 2-Propanol

Chemical Name: isopropanol

Chemical Formula: C3-H8-O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Isopropyl alcohol	67-63-0	100

Toxicological Data on Ingredients: Isopropyl alcohol: ORAL (LD50): Acute: 5045 mg/kg [Rat]. 3600 mg/kg [Mouse]. 6410 mg/kg [Rabbit]. DERMAL (LD50): Acute: 12800 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer, permeator).

Potential Chronic Health Effects:

Slightly hazardous in case of skin contact (sensitizer).

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC.

MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Development toxin [POSSIBLE].

The substance may be toxic to kidneys, liver, skin, central nervous system (CNS).

Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Skin Contact:

Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops. Cold water may be used.

Serious Skin Contact: Not available.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 399°C (750.2°F)

Flash Points: CLOSED CUP: 11.667°C (53°F) - 12.778 deg. C (55 deg. F) (TAG)

Flammable Limits: LOWER: 2% UPPER: 12.7%

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances:

Highly flammable in presence of open flames and sparks, of heat.

Flammable in presence of oxidizing materials.

Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available.

Explosive in presence of open flames and sparks, of heat.

Fire Fighting Media and Instructions:

Flammable liquid, soluble or dispersed in water.

SMALL FIRE: Use DRY chemical powder.

LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:

Vapor may travel considerable distance to source of ignition and flash back. CAUTION: MAY BURN WITH NEAR INVISIBLE FLAME.

Hydrogen peroxide sharply reduces the autoignition temperature of Isopropyl alcohol.

After a delay, Isopropyl alcohol ignites on contact with dioxgenyl tetrafluorborate, chromium trioxide, and potassium tert-butoxide. When heated to decomposition it emits acrid smoke and fumes.

Special Remarks on Explosion Hazards:

Secondary alcohols are readily autooxidized in contact with oxygen or air, forming ketones and hydrogen peroxide. It can become potentially explosive.

It reacts with oxygen to form dangerously unstable peroxides which can concentrate and explode during distillation or evaporation. The presence of 2-butanone increases the reaction rate for peroxide formation.

Explosive in the form of vapor when exposed to heat or flame. May form explosive mixtures with air.

Isopropyl alcohol + phosgene forms isopropyl chloroformate and hydrogen chloride.

In the presence of iron salts, thermal decomposition can occur, which in some cases can become explosive.

A homogeneous mixture of concentrated peroxides + isopropyl alcohol are capable of detonation by shock or heat.

Barium perchlorate + isopropyl alcohol gives the highly explosive alkyl perchlorates.

It forms explosive mixtures with trinitormethane and hydrogen peroxide.

It produces a violent explosive reaction when heated with aluminum isopropoxide + crotonaldehyde.

Mixtures of isopropyl alcohol + nitroform are explosive.

Section 6: Accidental Release Measures**Small Spill:**

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:

Flammable liquid.

Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage**Precautions:**

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids.

Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 983 STEL: 1230 (mg/m³) [Australia]

TWA: 200 STEL: 400 (ppm) from ACGIH (TLV) [United States] [1999]

TWA: 980 STEL: 1225 (mg/m³) from NIOSH
TWA: 400 STEL: 500 (ppm) from NIOSH
TWA: 400 STEL: 500 (ppm) [United Kingdom (UK)]
TWA: 999 STEL: 1259 (mg/m³) [United Kingdom (UK)]
TWA: 400 STEL: 500 (ppm) from OSHA (PEL) [United States]
TWA: 980 STEL: 1225 (mg/m³) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor:

Pleasant. Odor resembling that of a mixture of ethanol and acetone.

Taste: Bitter. (Slight.)

Molecular Weight: 60.1 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 82.5°C (180.5°F)

Melting Point: -88.5°C (-127.3°F)

Critical Temperature: 235°C (455°F)

Specific Gravity: 0.78505 (Water = 1)

Vapor Pressure: 4.4 kPa (@ 20°C)

Vapor Density: 2.07 (Air = 1)

Volatility: Not available.

Odor Threshold:

22 ppm (Sittig, 1991)

700 ppm for unadapted panelists (Verschuren, 1983).

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, n-octanol, acetone.

Solubility:

Easily soluble in cold water, hot water, methanol, diethyl ether, n-octanol, acetone.

Insoluble in salt solution.

Soluble in benzene.

Miscible with most organic solvents including alcohol, ethyl alcohol, chloroform.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, Ignition sources, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Reacts violently with hydrogen + palladium combination, nitroform, oleum, COCl₂, aluminum triisopropoxide, oxidants

Incompatible with acetaldehyde, chlorine, ethylene oxide, isocyanates, acids, alkaline earth, alkali metals, caustics, amines, crotonaldehyde, phosgene, ammonia.

Isopropyl alcohol reacts with metallic aluminum at high temperatures.

Isopropyl alcohol attacks some plastics, rubber, and coatings.

Vigorous reaction with sodium dichromate + sulfuric acid.

Special Remarks on Corrosivity: May attack some forms of plastic, rubber and coating

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.

Acute oral toxicity (LD50): 3600 mg/kg [Mouse].

Acute dermal toxicity (LD50): 12800 mg/kg [Rabbit].

Acute toxicity of the vapor (LC50): 16000 8 hours [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC.

DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Development toxin [POSSIBLE].

May cause damage to the following organs: kidneys, liver, skin, central nervous system (CNS).

Other Toxic Effects on Humans:

Hazardous in case of ingestion, of inhalation.

Slightly hazardous in case of skin contact (irritant, sensitizer, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive/teratogenic effects (fertility, fetotoxicity, developmental

abnormalities(developmental toxin)) based on animal studies.

Detected in maternal milk in human.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects:

Skin: May cause mild skin irritation, and sensitization.

Eyes: Can cause eye irritation.

Inhalation: Breathing in small amounts of this material during normal handling is not likely to cause harmful effects. However, breathing large amounts may be harmful and may affect the respiratory system and mucous membranes (irritation), behavior and brain (Central nervous system depression - headache, dizziness, drowsiness, stupor, incoordination, unconsciousness, coma and possible death), peripheral nerve and sensation, blood, urinary system, and liver.

Ingestion: Swallowing small amounts during normal handling is not likely to cause harmful effects. Swallowing large amounts may be harmful. Swallowing large amounts may cause gastrointestinal tract irritation with nausea, vomiting and diarrhea, abdominal pain. It also may affect the urinary system, cardiovascular system, sense organs, behavior or central nervous system (somnolence, generally depressed activity, irritability, headache, dizziness, drowsiness), liver, and respiratory system (breathing difficulty).

Chronic Potential Health Effects:

May cause defatting of the skin and dermatitis and allergic reaction.
May cause adverse reproductive effects based on animal data (studies).

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 100000 mg/l 96 hours [Fathead Minnow]. 64000 mg/l 96 hours [Fathead Minnow].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Isopropyl Alcohol UNNA: 1219 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Connecticut hazardous material survey.: Isopropyl alcohol
Illinois toxic substances disclosure to employee act: Isopropyl alcohol
Rhode Island RTK hazardous substances: Isopropyl alcohol
Pennsylvania RTK: Isopropyl alcohol
Florida: Isopropyl alcohol
Minnesota: Isopropyl alcohol
Massachusetts RTK: Isopropyl alcohol
New Jersey: Isopropyl alcohol
New Jersey spill list: Isopropyl alcohol
Director's list of Hazardous Substances: Isopropyl alcohol
Tennessee: Isopropyl alcohol
TSCA 8(b) inventory: Isopropyl alcohol
TSCA 4(a) final testing order: Isopropyl alcohol
TSCA 8(a) IUR: Isopropyl alcohol
TSCA 8(d) H and S reporting: Isopropyl alcohol: Effective date: 12/15/86 Sunset Date: 12/15/96
TSCA 12(b) one time export: Isopropyl alcohol
SARA 313 toxic chemical notification and release reporting: Isopropyl alcohol

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).

CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R11- Highly flammable.

R36- Irritating to eyes.

S7- Keep container tightly closed.

S16- Keep away from sources of ignition - No smoking.

S24/25- Avoid contact with skin and eyes.

S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves.

Lab coat.

Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.

Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 05:53 PM

Last Updated: 05/22/2009 09:11 AM

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Section 1. Chemical product and company identification

Product name	: Chlorine
Supplier	: AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
Product use	: Synthetic/Analytical chemistry.
Synonym	: bertholite; chloor (dutch); chlor (german); chlore (french); chlorine (dot); chlorine mol.; cloro (italian); molecular chlorine
MSDS #	: 001015
Date of Preparation/Revision	: 4/13/2009.
In case of emergency	: 1-866-734-3438

Section 2. Hazards identification

Physical state	: Gas. [GREENISH-YELLOW GAS WITH SUFFOCATING ODOR]
Emergency overview	: DANGER! OXIDIZER. CAUSES SEVERE RESPIRATORY TRACT, EYE AND SKIN BURNS. HARMFUL IF INHALED. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CONTACT WITH COMBUSTIBLE MATERIAL MAY CAUSE FIRE. CONTENTS UNDER PRESSURE. Do not puncture or incinerate container. Do not breathe gas. Do not get on skin or clothing. May cause target organ damage, based on animal data. Use only with adequate ventilation. Keep container closed. Do not get in eyes, on skin or on clothing. Avoid breathing gas. Wash thoroughly after handling. Store in tightly-closed container. Avoid contact with combustible materials. Contact with rapidly expanding gases can cause frostbite.
Target organs	: May cause damage to the following organs: lungs, upper respiratory tract, skin, eyes.
Routes of entry	: Inhalation Dermal Eyes
Potential acute health effects	
Eyes	: Severely corrosive to the eyes. Causes severe burns. Contact with rapidly expanding gas may cause burns or frostbite.
Skin	: Severely corrosive to the skin. Causes severe burns. Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation	: Toxic by inhalation. Severely corrosive to the respiratory system.
Ingestion	: Ingestion is not a normal route of exposure for gases
Potential chronic health effects	: CARCINOGENIC EFFECTS: A4 (Not classifiable for humans or animals.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available.
Medical conditions aggravated by over-exposure	: Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.
See toxicological information (section 11)	

Section 3. Composition, Information on Ingredients

<u>Name</u>	<u>CAS number</u>	<u>% Volume</u>	<u>Exposure limits</u>
Chlorine	7782-50-5	100	<p>ACGIH TLV (United States, 1/2008). STEL: 2.9 mg/m³ 15 minute(s). STEL: 1 ppm 15 minute(s). TWA: 1.5 mg/m³ 8 hour(s). TWA: 0.5 ppm 8 hour(s).</p> <p>NIOSH REL (United States, 6/2008). CEIL: 1.45 mg/m³ 15 minute(s). CEIL: 0.5 ppm 15 minute(s).</p> <p>OSHA PEL (United States, 11/2006). CEIL: 3 mg/m³ CEIL: 1 ppm</p> <p>OSHA PEL 1989 (United States, 3/1989). STEL: 3 mg/m³ 15 minute(s). STEL: 1 ppm 15 minute(s). TWA: 1.5 mg/m³ 8 hour(s). TWA: 0.5 ppm 8 hour(s).</p>

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

- Flammability of the product** : Non-flammable.
- Products of combustion** : Decomposition products may include the following materials: halogenated compounds
- Fire hazards in the presence of various substances** : Extremely flammable in the presence of the following materials or conditions: reducing materials, combustible materials, organic materials and alkalis.
- Fire-fighting media and instructions** : Use an extinguishing agent suitable for the surrounding fire.

 Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.

 Contains gas under pressure. Contact with combustible material may cause fire. This material increases the risk of fire and may aid combustion. In a fire or if heated, a pressure increase will occur and the container may burst or explode.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

- Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Eliminate all ignition sources if safe to do so. Do not touch or walk through spilled material. Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
- Methods for cleaning up** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

- Handling** : Use only with adequate ventilation. Wash thoroughly after handling. High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Do not get in eyes, on skin or on clothing. Keep container closed. Do not get on skin or clothing. Store in tightly-closed container. Avoid contact with combustible materials. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
- Storage** : Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalis, reducing agents and combustibles. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

- Engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.
- Personal protection**
- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
- Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93
- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
- Personal protection in case of a large spill** : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product. Full chemical-resistant suit and self-contained breathing apparatus should be worn only by trained and authorized persons.

Product name

chlorine

ACGIH TLV (United States, 1/2008).

STEL: 2.9 mg/m³ 15 minute(s).

STEL: 1 ppm 15 minute(s).

TWA: 1.5 mg/m³ 8 hour(s).

TWA: 0.5 ppm 8 hour(s).

NIOSH REL (United States, 6/2008).

CEIL: 1.45 mg/m³ 15 minute(s).

CEIL: 0.5 ppm 15 minute(s).

OSHA PEL (United States, 11/2006).

CEIL: 3 mg/m³

CEIL: 1 ppm

OSHA PEL 1989 (United States, 3/1989).

Chlorine

STEL: 3 mg/m³ 15 minute(s).
STEL: 1 ppm 15 minute(s).
TWA: 1.5 mg/m³ 8 hour(s).
TWA: 0.5 ppm 8 hour(s).

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

Molecular weight	: 70.9 g/mole
Molecular formula	: Cl ₂
Boiling/condensation point	: -33.9°C (-29°F)
Melting/freezing point	: -101.1°C (-150°F)
Critical temperature	: 143.9°C (291°F)
Vapor pressure	: 85.3 (psig)
Vapor density	: 2.4 (Air = 1)
Specific Volume (ft³/lb)	: 5.4054
Gas Density (lb/ft³)	: 0.185

Section 10. Stability and reactivity

Stability and reactivity	: The product is stable.
Incompatibility with various substances	: Extremely reactive or incompatible with the following materials: reducing materials, combustible materials, organic materials and alkalis.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization	: Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Product/ingredient name	Result	Species	Dose	Exposure
chlorine	LC50 Inhalation Gas.	Rat	293 ppm	1 hours
	LC50 Inhalation Gas.	Rat	293 ppm	1 hours
	LC50 Inhalation Gas.	Mouse	137 ppm	1 hours

IDLH : 10 ppm

Chronic effects on humans : **CARCINOGENIC EFFECTS:** A4 (Not classifiable for humans or animals.) by ACGIH. May cause damage to the following organs: lungs, upper respiratory tract, skin, eyes.

Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects : No known significant effects or critical hazards.

Mutagenic effects : No known significant effects or critical hazards.

Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Ecotoxicity data

Aquatic ecotoxicity

Product/ingredient name	Test	Result	Species	Exposure
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Chlorine

chlorine	-	Acute LC50 0.75 mg/L Marine water	Crustaceans - Blue crab - Callinectes sapidus - Adult	48 hours
	-	Acute LC50 838 ug/L Fresh water	Crustaceans - Aquatic sowbug - Asellus racovitzai	2 days
	-	Acute LC50 752 to 33400 ug/L Fresh water	Crustaceans - Aquatic sowbug - Asellus racovitzai	2 days
	-	Acute LC50 380 to 3390 ug/L Fresh water	Crustaceans - Aquatic sowbug - Asellus racovitzai	2 days
	-	Acute LC50 354 to 488 ug/L Fresh water	Crustaceans - Aquatic sowbug - Asellus racovitzai	2 days
	-	Acute LC50 150 ug/L Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	-	Acute LC50 136 ug/L Fresh water	Crustaceans - Aquatic sowbug - Asellus racovitzai	2 days
	-	Acute LC50 130 ug/L Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	-	Acute LC50 120 ug/L Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	-	Acute LC50 116 ug/L Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	-	Acute LC50 110 ug/L Fresh water	Daphnia - Water flea - Daphnia pulex	48 hours
	-	Acute LC50 107 to 110 ug/L Fresh water	Fish - Brook trout - Salvelinus fontinalis - Juvenile (Fledgling, Hatchling, Weanling) - 7.5 to 10 cm	96 hours
	-	Acute LC50 102 to 124 ug/L Fresh water	Fish - Brook trout - Salvelinus fontinalis - Juvenile (Fledgling, Hatchling, Weanling) - 10 to 15 cm	96 hours
	-	Acute LC50 91 ug/L Fresh water	Daphnia - Water flea - Daphnia pulex	48 hours
	-	Acute LC50 90 ug/L Marine water	Fish - Spot - Leiostomus xanthurus	96 hours
	-	Acute LC50 85 to 5670 ug/L Fresh water	Crustaceans - Aquatic sowbug - Asellus racovitzai	2 days
	-	Acute LC50 85 ug/L Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	-	Acute LC50 75 ug/L	Daphnia - Water	48 hours

Chlorine

-	Fresh water	flea - Daphnia pulex	
-	Acute LC50 40 ug/L Fresh water	Daphnia - Water flea - Daphnia pulex	48 hours
-	Acute LC50 37 ug/L Marine water	Fish - Atlantic silverside - Menidia menidia	96 hours
-	Acute LC50 37 to 220 ug/L Marine water	Fish - Northern pipefish - Syngnathus fuscus	96 hours
-	Acute LC50 30 ug/L Fresh water	Daphnia - Water flea - Daphnia pulex	48 hours
-	Acute LC50 29 ug/L Fresh water	Fish - Rainbow trout,donaldson trout - Oncorhynchus mykiss	96 hours
-	Acute LC50 14 ug/L Fresh water	Fish - Rainbow trout,donaldson trout - Oncorhynchus mykiss	96 hours
-	Acute LC50 13.6 ug/L Fresh water	Crustaceans - Aquatic sowbug - Asellus racovitzai	2 days
-	Acute LC50 2.03 ug/L Fresh water	Crustaceans - Aquatic sowbug - Asellus racovitzai	2 days
-	Acute LC50 4720 ug/L Fresh water	Crustaceans - Aquatic sowbug - Asellus racovitzai	2 days

Environmental fate : Not available.

Environmental hazards : Water polluting material. May be harmful to the environment if released in large quantities.

Toxicity to the environment : Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1017	CHLORINE. Marine pollutant (chlorine)	2.3	Not applicable (gas).	  	Marine pollutant Reportable quantity 10 lbs. (4.54 kg) Limited quantity Yes. Packaging

Chlorine

						<p>instruction Passenger aircraft Quantity limitation: Forbidden.</p> <p>Cargo aircraft Quantity limitation: Forbidden.</p> <p>Special provisions 2, B9, B14, T50, TP19</p>
TDG Classification	UN1017	CHLORINE. Marine pollutant (chlorine)	2.3	Not applicable (gas).	  	<p>Marine pollutant</p> <p>Explosive Limit and Limited Quantity Index 0</p> <p>ERAP Index 500</p> <p>Passenger Carrying Ship Index Forbidden</p> <p>Passenger Carrying Road or Rail Index Forbidden</p>
Mexico Classification	UN1017	CHLORINE. Marine pollutant (chlorine)	2.3	Not applicable (gas).	  	-

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Section 15. Regulatory information

United States

- U.S. Federal regulations** : TSCA 8(a) CAIR: chlorine
United States inventory (TSCA 8b): This material is listed or exempted.
SARA 302/304/311/312 extremely hazardous substances: chlorine
SARA 302/304 emergency planning and notification: chlorine
SARA 302/304/311/312 hazardous chemicals: chlorine
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: chlorine: Fire hazard, Sudden release of pressure, Immediate (acute) health hazard
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: chlorine
Clean Air Act (CAA) 112 accidental release prevention: chlorine
Clean Air Act (CAA) 112 regulated flammable substances: No products were found.
Clean Air Act (CAA) 112 regulated toxic substances: chlorine

SARA 313

	<u>Product name</u>	<u>CAS number</u>	<u>Concentration</u>
Form R - Reporting requirements	: Chlorine	7782-50-5	100
Supplier notification	: Chlorine	7782-50-5	100

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

- State regulations** : **Connecticut Carcinogen Reporting**: This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.
Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.
New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
New York Acutely Hazardous Substances: This material is listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is listed.
Rhode Island Hazardous Substances: This material is not listed.

Canada

- WHMIS (Canada)** : Class A: Compressed gas.
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class E: Corrosive material
CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

United States

Label requirements

: OXIDIZER.
CAUSES SEVERE RESPIRATORY TRACT, EYE AND SKIN BURNS.
HARMFUL IF INHALED.
MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
CONTACT WITH COMBUSTIBLE MATERIAL MAY CAUSE FIRE.
CONTENTS UNDER PRESSURE.

Canada

Label requirements

: Class A: Compressed gas.
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class E: Corrosive material

Hazardous Material Information System (U.S.A.)

Health	*	3
Flammability		0
Physical hazards		2

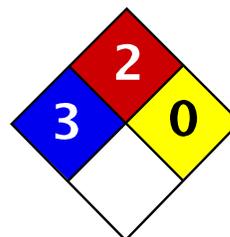
National Fire Protection Association (U.S.A.)



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.



Health	3
Fire	2
Reactivity	0
Personal Protection	G

Material Safety Data Sheet

Formaldehyde 37% solution MSDS

Section 1: Chemical Product and Company Identification

Product Name: Formaldehyde 37% solution

Catalog Codes: SLF1426

CAS#: Mixture.

RTECS: LP8925000

TSCA: TSCA 8(b) inventory: Formaldehyde; Methyl alcohol; Water

CI#: Not applicable.

Synonym: Formalin

Chemical Name: Formaldehyde

Chemical Formula: HCHO

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Formaldehyde	50-00-0	36.5-38
Methyl alcohol	67-56-1	10-15
Water	7732-18-5	47-53.5

Toxicological Data on Ingredients: Formaldehyde: ORAL (LD50): Acute: 100 mg/kg [Rat]. 42 mg/kg [Mouse]. 260 mg/kg [Guinea pig]. MIST (LC50): Acute: 454000 mg/m 4 hours [Mouse]. Methyl alcohol: ORAL (LD50): Acute: 5628 mg/kg [Rat]. DERMAL (LD50): Acute: 15800 mg/kg [Rabbit]. VAPOR (LC50): Acute: 64000 ppm 4 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of eye contact (irritant), of ingestion, . Hazardous in case of skin contact (irritant, sensitizer, permeator), of eye contact (corrosive). Slightly hazardous in case of skin contact (corrosive). Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:

Hazardous in case of skin contact (sensitizer).

CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2A (Probable for human.) by IARC [Formaldehyde].

MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. [Formaldehyde]. Mutagenic for bacteria and/or yeast. [Formaldehyde]. Mutagenic for mammalian somatic cells. [Methyl alcohol]. Mutagenic for bacteria and/or yeast. [Methyl alcohol].

TERATOGENIC EFFECTS: Classified POSSIBLE for human [Methyl alcohol].

DEVELOPMENTAL TOXICITY: Not available

The substance may be toxic to kidneys, liver, skin, central nervous system (CNS).

Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 430°C (806°F)

Flash Points: CLOSED CUP: 50°C (122°F). OPEN CUP: 60°C (140°F).

Flammable Limits: The greatest known range is LOWER: 6% UPPER: 36.5% (Methyl alcohol)

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances:

Flammable in presence of open flames and sparks, of heat.

Non-flammable in presence of shocks, of oxidizing materials, of reducing materials, of combustible materials, of organic materials, of metals, of acids, of alkalis.

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions:

Flammable liquid, soluble or dispersed in water.

SMALL FIRE: Use DRY chemical powder.

LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:

Explosive in the form of vapor when exposed to heat or flame. Vapor may travel considerable distance to source of ignition and flash back. When heated to decomposition, it emits acrid smoke and irritating fumes. CAUTION: MAY BURN WITH NEAR INVISIBLE FLAME (Methyl alcohol)

Special Remarks on Explosion Hazards:

Reaction with peroxide, nitrogen dioxide, and permformic acid can cause an explosion.
(Formaldehyde gas)

Section 6: Accidental Release Measures**Small Spill:**

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:

Flammable liquid. Poisonous liquid.

Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage**Precautions:**

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, acids, alkalis, moisture.

Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves (impervious).

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

Formaldehyde gas
STEL: 0.3 (ppm) from ACGIH (TLV) [United States]
STEL: 0.37 (mg/m³) from ACGIH (TLV) [United States]
TWA: 0.75 STEL: 2 (ppm) from OSHA (PEL) [United States]
TWA: 2 STEL: 2 (ppm) [United Kingdom (UK)]
TWA: 2.5 STEL: 2.5 (mg/m³) [United Kingdom (UK)]
Methyl alcohol
TWA: 200 from OSHA (PEL) [United States]
TWA: 200 STEL: 250 (ppm) from ACGIH (TLV) [United States] [1999]
STEL: 250 from NIOSH [United States]
TWA: 200 STEL: 250 (ppm) from NIOSH SKIN
TWA: 200 STEL: 250 (ppm) [Canada]
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pungent. Suffocating. (Strong.)

Taste: Not available.

Molecular Weight: 30.02

Color: Clear Colorless.

pH (1% soln/water): 3 [Acidic.] pH of the solution as is.

Boiling Point: 98°C (208.4°F)

Melting Point: -15°C (5°F)

Critical Temperature: The lowest known value is 240°C (464°F) (Methyl alcohol).

Specific Gravity: 1.08 (Water = 1)

Vapor Pressure: 2.4 kPa (@ 20°C)

Vapor Density: 1.03 (Air = 1)

Volatility: 100% (w/w).

Odor Threshold: The highest known value is 100 ppm (Methyl alcohol)

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Non-ionic.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:

Easily soluble in cold water, hot water.

Soluble in diethyl ether, acetone, alcohol

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources (flames, sparks), incompatible materials

Incompatibility with various substances:

Reactive with oxidizing agents, reducing agents, acids, alkalis.
Slightly reactive to reactive with metals.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Also incompatible with urea, phenol, isocyanates, anhydrides, amines, AZO compounds, carbonyl compounds, oxides(e.g. nitrogen dioxide), performic acid, dithiocarbmates, or peroxides.
Polymerization can be inhibited by the addition of methanol or stabilizers such as hydroxypropyl methyl cellulose, methyl ethyl celluloses, or isophthalobisguanamine.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:

Acute oral toxicity (LD50): 42 mg/kg [Mouse]. (Formaldehyde)
Acute dermal toxicity (LD50): 15800 mg/kg [Rabbit]. (Methyl alcohol).
Acute toxicity of the mist(LC50): 454000 mg/m
4 hours [Mouse]. (Formaldehyde)

3

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2A (Probable for human.) by IARC [Formaldehyde].
MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. [Formaldehyde]. Mutagenic for bacteria and/or yeast. [Formaldehyde]. Mutagenic for mammalian somatic cells. [Methyl alcohol]. Mutagenic for bacteria and/or yeast. [Methyl alcohol].
TERATOGENIC EFFECTS: Classified POSSIBLE for human [Methyl alcohol].
DEVELOPMENTAL TOXICITY: Not available
May cause damage to the following organs: kidneys, liver, central nervous system (CNS).

Other Toxic Effects on Humans:

Very hazardous in case of ingestion, .
Hazardous in case of skin contact (irritant, sensitizer, permeator), of eye contact (corrosive), of inhalation (lung corrosive).
Slightly hazardous in case of skin contact (corrosive).

Special Remarks on Toxicity to Animals:

Formaldehyde:
LD50 [Rabbit] - Route: Skin; Dose: 270 ul/kg

Special Remarks on Chronic Effects on Humans:

Exposure to Formaldehyde and Methanol may affect genetic material (mutagenic).
Exposure to Formaldehyde and Methanol may cause adverse reproductive effects and birth defects(teratogenic).
Adverse reproductive effects of Formaldehyde as well as Methanol are primarily based on animal studies. Very few human studies have been done on the adverse reproductive effects from exposure to Formaldehyde. Studies produced a weak association (limited evidence) between adverse human female reproductive effects and occupational exposure. Furthermore, no human data could be found on adverse reproductive effects from occupational exposure to Methanol.
Exposure to Formaldehyde may cause cancer.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects:

Skin: Corrosive. Causes skin irritation which may range from mild to severe with possible burns depending on the extent of exposure and concentration of solution. Other symptoms may include brownish discoloration of the skin, urticaria, and pustulovesicifular eruptions. May be absorbed through skin with symptoms paralleling those of ingestion.

Eyes: Corrosive. Contact with liquid causes severe eye irritation and burns. It may cause irreversible eye damage (severe corneal Solutions containing low formaldehyde concentrations may produce transient discomfort and irritation.

Inhalation: Causes irritation of the respiratory tract (nose, throat, airways). Symptoms may include dry and sore mouth and throat, thirst, and sleep disturbances, difficulty breathing, shortness of breath, coughing, sneezing, wheezing rhinitis, chest tightness, pulmonary edema, bronchitis, tracheitis, laryngospasm, pneumonia, palpitations. It may also affect metabolism weight loss, metabolic acidosis), behavior/central nervous system (excitement, central nervous system depression, somnolence, convulsions, stupor, aggression, headache, weakness, dizziness, drowsiness, coma), peripheral nervous system, and blood.

Ingestion: Harmful if swallowed. May be fatal. Causes gastrointestinal irritation with nausea, vomiting (possibly with blood), diarrhea, severe pain in mouth, throat and stomach, and possible corrosive injury to the gastrointestinal mucosa/ulceration or bleeding from stomach. May also affect the liver(jaundice), urinary system/kidneys (difficulty urinating, albuminuria, hematuria, anuria), blood, endocrine system, respiration (respiratory obstruction, pulmonary edema, bronchiolar obstruction), cardiovascular system (hypotension), metabolism (metabolic acidosis), eyes (retinal changes, visual field changes), and behavior/central nervous system (symptoms similar to those for inhalation). Contains Methanol which may cause blindness if swallowed.

Chronic Potential Health Effects:

Skin: Prolonged or repeated exposure may cause contact dermatitis both irritant and allergic. It may also cause skin discoloration.

Inhalation: Although there is no clear evidence, prolonged or repeated exposure may induce allergic asthma. Other effects are similar to that of acute exposure.

Ingestion: Prolonged or repeated ingestion may cause gastrointestinal tract irritation and ulceration or bleeding from the stomach. Other effects may be similar to that of acute ingestion.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation:

Methanol in water is rapidly biodegraded and volatilized. Aquatic hydrolysis, oxidation, photolysis, adsorption to sediment, and bioconcentration are not significant fate processes. The half-life of methanol in surfact water ranges from 24 hrs. to 168 hrs.

Based on its vapor pressure, methanol exists almost entirely in the vapor phase in the ambient atmosphere. It is degraded by reaction with photochemically produced hydroxyl radicals and has an estimated half-life of 17.8 days. Methanol is physically removed from air by rain due to its solubility. Methanol can react with NO2 in polluted to form methyl nitrate.

The half-life of methanol in air ranges from 71 hrs. (3 days) to 713 hrs. (29.7 days) based on photooxidation half-life in air. (Methyl alcohol)

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification:

CLASS 3: Flammable liquid.

Class 8: Corrosive material

Identification: : Formaldehyde Solution, flammable (Methyl alcohol) UNNA: 1198 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute:

Formaldehyde

California prop. 65 (no significant risk level): Formaldehyde: 0.04 mg/day (inhalation)

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Formaldehyde Solution

Connecticut hazardous material survey.: Formaldehyde; Methyl alcohol

Illinois toxic substances disclosure to employee act: Formaldehyde; Methyl alcohol

Illinois chemical safety act: Formaldehyde; Methyl alcohol

New York release reporting list: Formaldehyde; Methyl alcohol

Rhode Island RTK hazardous substances: Formaldehyde; Methyl alcohol

Pennsylvania RTK: Formaldehyde; Methyl alcohol

Minnesota: Formaldehyde gas; Methyl alcohol

Massachusetts RTK: Formaldehyde; Methyl alcohol

Massachusetts spill list: Formaldehyde; Methyl alcohol

New Jersey: Formaldehyde; Methyl alcohol

New Jersey spill list: Formaldehyde; Methyl alcohol

Louisiana RTK reporting list: Formaldehyde

Louisiana spill reporting: Formaldehyde; Methyl alcohol

California Director's List of Hazardous Substances: Formaldehyde; Methyl alcohol

TSCA 8(b) inventory: Formaldehyde gas; Methyl alcohol; Water

TSCA 4(f) priority risk review: Formaldehyde, Reagent, ACS

SARA 302/304/311/312 extremely hazardous substances: Formaldehyde

SARA 313 toxic chemical notification and release reporting: Formaldehyde; Methyl alcohol

CERCLA: Hazardous substances.: Formaldehyde: 100 lbs. (45.36 kg); Methyl alcohol: 5000 lbs. (2268 kg);

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:**WHMIS (Canada):**

CLASS B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).

CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):**HMIS (U.S.A.):**

Health Hazard: 3

Fire Hazard: 2

Reactivity: 0

Personal Protection: G

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 2

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves (impervious).

Lab coat.

Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.

Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 05:35 PM

Last Updated: 11/06/2008 12:00 PM

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Material Safety Data Sheet

MSDS-09588-0-001

Rev.: E

Product: CIDEX® OPA Solution

Issue Date: 6-28-05

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND THE COMPANY/UNDERTAKING

Supplier:

Advanced Sterilization Products
 33 Technology Drive
 Irvine, CA 92618

Customer service telephone: 1-800-755-5900
Emergency telephone number: 1-877-208-6653 24 hrs
Product name: CIDEX OPA Solution
Synonyms: None

2. COMPOSITION/INFORMATION ON INGREDIENTS

The ingredients at their given percentages in this product are not considered hazardous to your health.

Components	CAS Number	Weight %	J&J - OEL Data (TWA - 8 hr)	J&J - OEL Data (STEL):	J&J - OEL Data (Ceiling Limit Value):	J&J - PBOEL
<i>ortho</i> -Phthalaldehyde (1,2 – benzenedicarboxaldehyde)	643-79-8	<1	Not Determined	Not Determined	Not Determined	Not Determined

3. HAZARDS IDENTIFICATION

Emergency overview: May cause eye, skin and respiratory irritation.
 May elicit an allergic reaction.
 CIDEX OPA Solution has been reported to cause anaphylactic-like reactions in bladder cancer patients undergoing repeated cystoscopy.
 CIDEX OPA Solution should not be used to reprocess instruments for patients that have shown previous sensitivity to this solution or any of its ingredients.

Properties affecting health: May cause sensitization by repeated skin contact.

Principle routes of exposure:

- Oral:** Not anticipated to be a significant route of occupational exposure.
- Eye contact:** May cause eye irritation and redness.
- Skin contact:** May cause skin irritation. Repeated exposure may cause skin dryness or cracking. Exposure to skin may cause temporary staining.
- Ingestion:** Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. Exposure can irritate and discolor the tissues of the mouth, esophagus and other tissues of the digestive tract.

Inhalation:

May cause irritation, including but not limited to discharge, coughing, wheezing tightness of chest and throat, difficulty breathing and stinging sensation in nose and throat, tingling of mouth and lips, headache, loss of smell and dry mouth. Symptoms are temporary and reversible.

Hazard information:

Target organ effects: None
Reproductive effects: Not a reproductive effector.
Mutagenic effects: Not mutagenic in the Ames assay.
Sensitization: May cause sensitization.

Carcinogenicity rating:

Components	CAS Number	J & J:	NTP:	IARC:	California Proposition 65 List:
<i>ortho</i> -Phthalaldehyde (1,2 – benzenedicarboxaldehyde)	643-79-8	Not Determined	Not Determined	Not Determined	Not Determined

Signs and symptoms: None.

Medical conditions aggravated by exposure: Inhalation of vapor may cause asthma-like symptoms (chest discomfort and tightness, difficulty with breathing) as well as aggravate pre-existing asthma.

4. FIRST AID MEASURES

Eye contact: In the case of contact with eyes, rinse immediately with plenty of water for 15 minutes and seek medical attention.

Ingestion: Do not induce vomiting. Rinse mouth followed by drinking a large quantity of water

Inhalation: Move to fresh air immediately. If experiencing difficulty breathing, seek medical attention.

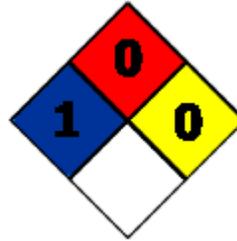
Skin contact: Wash contaminated areas thoroughly with soap and water. Remove contaminated clothing and wash before re-use. Seek medical attention if irritation develops or persists.

Protection of first-aiders: None.

Notes to physician: Probable damage to the mucosa from oral exposure may contraindicate the use of gastric lavage.

5. FIRE-FIGHTING MEASURES

Flash point (°F):	Not applicable
Flash point (°C):	Not applicable
Autoignition temperature:	Not applicable
Flammable limits in air - lower (%):	Not applicable
NFPA rating:	Health: 1 flammability: 0 reactivity: 0
HMIS/ NFPA rating and classification:	



Fire fighting information:

Suitable extinguishing media:	Use any extinguishing agent which is suitable for the surrounding fire
Extinguishing media which must not be used for safety reasons:	None
Specific methods:	None
Special protective equipment for firefighters:	Wear self-contained breathing apparatus for fire fighting if necessary.
Hazardous combustion products:	None
Explosivity:	None
Explosion limits:	
lower:	None
upper:	None

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Wear eye and skin protection while handling material for clean-up. Avoid breathing vapors and/or mists.
Environmental precautions:	Do not wash down sewers or waterways.
Methods for cleaning up:	If required, neutralize by sprinkling approximately 25 grams of glycine (CAS# 56-40-6) powder per gallon of CIDEX OPA Solution spill. Thoroughly blend the glycine into the spill using mop or other tools. Allow 5 minutes contact for neutralization. Pick up and transfer to properly labeled containers. Allow neutralization to continue for 1 hour and then dispose of in accordance with all applicable federal, state, and local regulations. Clean contaminated surface thoroughly.

7. HANDLING AND STORAGE

Handling:

Technical measures/precautions:	Use in well ventilated area and use with appropriate exhaust ventilation, for example a minimum of 10 air exchanges per hour or as defined by state and local regulations.
Safe handling advice:	Wear appropriate personal protection. Avoid contact with skin, eyes and clothing. Remove contaminated clothing and laundry before reuse.

Storage:

Technical measures/storage conditions:	This product should be stored between 59°F (15°C) and 86°F (30°C) Keep containers tightly closed.
Incompatible products:	Avoid contact with strong acids and bases. Keep from contact with oxidizing materials.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering controls:	Ensure adequate ventilation.
Eye protection:	Eye protection recommended.
Hand protection:	Chemical resistant gloves recommended.
Skin and body protection	Wear suitable protective clothing.
Respiratory protection:	None required.
Other/general protection:	None required.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear liquid
Physical state:	Liquid
Color:	Light blue
pH:	7.2-7.8
Odor:	Slight Odor
Boiling temperature (°F):	212
Boiling temperature (°C):	100
Freezing point/range (°C):	0
Freezing point/range (°F):	32
Specific gravity:	1.0003g/cc
Evaporation rate:	similar to water
Water solubility:	soluble

10. STABILITY AND REACTIVITY

Chemical stability:	Stable under recommended storage conditions.
Hazardous polymerization:	Hazardous polymerization does not occur.
Hazardous decomposition products:	Unknown on product.

Materials to avoid:

Strong acids and strong bases.
Stay away from strong oxidizing agents.

Conditions to avoid:

Extremes of temperature and direct sunlight.

11. TOXICOLOGICAL INFORMATION**Acute toxicity**

LD50/oral/rat (mg/kg) = >5000 mg/kg
LD50 Dermal Rabbit (mg/kg): >2000 mg/kg

Local effects

Oral: Non-toxic
Eye irritation: May cause eye irritation.
Skin irritation: May cause skin irritation.
Inhalation: Unknown on product.

Chronic toxicity

Oral: Unknown on product.
Inhalation: Unknown on product.
Dermal: Unknown on product.

Subchronic toxicity

Oral: Oral administration of o-phthalaldehyde to rats for 90 days resulted in a NOEL of 5mg/kg/day.
Dermal: Unknown on product.

Specific effects

Corrosive effects: Not corrosive.
Sensitization: May elicit an allergic reaction.
Target organ effects: None
Mutagenic effects: Not mutagenic in Ames test.

Reproductive effects: Unknown on product.
Developmental effects: Oral administration of o-phthalaldehyde to pregnant rats indicated that at maternally non-toxic doses (less than 10 mg/kg/day) there was no developmental effect.

Carcinogenic effects: Unknown on product.

12. ECOLOGICAL INFORMATION**Ecotoxicity:**

Ecotoxicity effects: Unknown on this product.
Aquatic toxicity effects: This product is harmful to aquatic organisms.

Mobility: Unknown on product.
Persistence / degradability: Unknown on product.
Bioaccumulation: Unknown on product.
Degradation: Unknown on product.

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products:

Waste disposal must be in accordance with appropriate US, Federal, State and International regulations. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority.
This product is not a hazardous waste as defined by EPA definitions.

Contaminated packaging:

Do not re-use empty containers

Methods for cleaning up:

If required, neutralize by sprinkling approximately 25 grams of glycine (CAS # 56-40-6) powder per gallon of CIDEX OPA Solution spill. Thoroughly blend the glycine into the spill using mop or other tools. Allow 5 minutes contact for neutralization. Pick up and transfer to properly labeled containers. Allow neutralization to continue for 1 hour and then dispose of in accordance with all applicable federal, state, and local regulations.
Clean contaminated surface thoroughly.

14. TRANSPORT INFORMATION

DOT:

DOT UN-No:	Not applicable
DOT shipping name:	Not regulated
Hazard class:	Not applicable
Subsidiary risk (hazard class):	Not applicable
Packing group:	Not applicable
DOT reportable quantity (lbs):	Not applicable

IMO/IMDG:

Hazard class:	Not applicable
IMDG page:	Not applicable
IMDG-labels:	Not applicable
Packing group:	Not applicable
MFAG table No.:	Not applicable
Proper shipping name:	Not regulated
UN/Id No.:	Not applicable

ADR/RID:

Hazard class/packing group:	Not applicable
Item:	Not applicable
ADR/RID-labels:	Not applicable
UN/Id No.:	Not applicable
Proper shipping name:	Not regulated
TREM-card:	Not applicable

IATA/ICAO:

Hazard class:	Not applicable
Packing group:	Not applicable
Proper shipping name:	Not regulated
ID/UN No.:	Not applicable
IATA - label:	Not applicable
ERG #	Not applicable

TDG (Canada):

Status:	Not applicable
Packing group:	Not applicable

Company: ADVANCED STERILIZATION PRODUCTS
Product name: CIDEX® OPA Solution

Product code: ASPOPA
CO-12305-2

15. REGULATORY INFORMATION

SARA (311, 312) hazard class:

Immediate health:	None
Delayed health:	None
Fire:	None
Sudden Release of Pressure Hazard:	None
Reactivity:	None

TSCA inventory list: Listed under TSCA: Yes

WHMIS:

WHMIS trade secret:	None
WHMIS hazard class:	None

Canada DSL inventory list: Listed on DSL: Yes

Notes:

1. SARA = Superfund Amendments and the Reauthorization Act.
2. CERCLA = Comprehensive Environmental Response, Compensations and Liability Act.
3. FIFRA = Federal Insecticide, Fungicide and Rodenticide Act
4. TSCA = Toxic Substance Control Act
5. WHMIS = Canadian Workplace Hazardous Materials Information System
6. This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. OTHER INFORMATION

This data sheet contains changes from the previous version in section(s):

None

Additional advice: None

Literary Reference: None

MSDS format: North American Format - U.S. and Canada
This Material Safety Data Sheet was prepared in accordance with OSHA 29 CFR 1910.1200.

Disclaimer:

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End of Safety Data Sheet



MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: NON-FLAMMABLE GAS MIXTURE
Containing the Following Component in Nitrogen Balance Gas:
Ethylene Oxide: 0.0005 - 0.02%

SYNONYMS: Not Applicable**CHEMICAL FAMILY NAME:** Not Applicable**FORMULA:** Not Applicable**Document Number:** 50029

Note: The Material Safety Data Sheet is for this gas mixture supplied in cylinders with 33 cubic feet (935 liters) or less gas capacity (DOT - 39 cylinders). This MSDS has been developed for various gas mixtures with the composition of components within the ranges listed in Section 2 (Composition and Information on Ingredients). Refer to the product label for information on the actual composition of the product.

PRODUCT USE:	Calibration of Monitoring and Research Equipment
SUPPLIER/MANUFACTURER'S NAME:	CALGAZ
ADDRESS:	821 Chesapeake Drive Cambridge, MD 21613
EMERGENCY PHONE:	CHEMTREC: 1-800-424-9300
BUSINESS PHONE:	1-410-228-6400
	General MSDS Information 1-713/868-0440
	Fax on Demand: 1-800/231-1366

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		NIOSH IDLH ppm	OTHER ppm
			TWA ppm	STEL ppm	TWA ppm	STEL ppm		
Ethylene Oxide	75-21-8	0.0005-0.02%	1	NE	1 See 29 CFR 1910.1047 (a)(2)	5 See 29 CFR 1910.104 7(a)(2)	800	NIOSH RELS: TWA = < 0.1 STEL = 5 (ceiling) 10 minute/day DFG MAK: Skin Carcinogen: IARC-1, MAK-2, NIOSH-Ca, NTP-K, OSHA-Ca, TLV-A2
Nitrogen	7727-37-9	Balance	There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					

NE = Not Established.

See Section 16 for Definitions of Terms Used.

NOTE (1): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This gas mixture has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This gas mixture is a colorless, odorless gas. The most significant, acute health hazard associated with releases of this gas mixture is the potential for development of oxygen-deficient atmospheres (especially in confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated. Low concentrations of the Ethylene Oxide component of this gas mixture can be irritating to eyes and upper respiratory system; inhalation of low levels of this gas may also cause nausea, vomiting, and numbing of the sense of smell. Ethylene Oxide is a central nervous system depressant; this effect is not expected from this gas mixture due to the low concentration of Ethylene Oxide. The Ethylene Oxide component can cause cancer, based on human information. Ethylene Oxide may harm reproductive capability, based on animal information and may cause inheritable genetic damage.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this gas mixture is by inhalation.

INHALATION: Due to the small size of an individual cylinder of this gas mixture, no unusual health effects from over-exposure to the product are anticipated under routine circumstances of use. The most significant, acute effect associated with a release of this gas mixture would be for the potential development of oxygen-deficient atmospheres. If this gas mixture is released in a small, poorly-ventilated area (i.e. an enclosed or confined space), an oxygen-deficient environment may occur. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of over-exposure, death may occur. The effects associated with various levels of oxygen are as follows:

CONCENTRATION OF OXYGEN

12-16% Oxygen:

10-14% Oxygen:

6-10% Oxygen:

Below 6%:

OBSERVED EFFECT

Breathing and pulse rate increased, muscular coordination slightly disturbed.

Emotional upset, abnormal fatigue, disturbed respiration.

Nausea, vomiting, collapse, or loss of consciousness.

Convulsive movements, possible respiratory collapse, and death.

Due to the presence of Ethylene Oxide in this gas mixture in concentrations of 5-200 ppm, inhalation over-exposures may cause upper respiratory system irritation. Symptoms of such over-exposure may include coughing, sneezing, and nasal congestion. Additionally, prolonged inhalation of low concentrations of Ethylene Oxide can cause nausea, vomiting, and numbing of the sense of smell. The following are symptoms of exposure to Ethylene Oxide at varying levels and duration of exposure. This level of exposure is not expected from this gas mixture, but the information is provided for additional information on the effects of Ethylene Oxide.

CONCENTRATION OF ETHYLENE OXIDE

500 ppm (estimated) for 2-3 minutes

> 700 ppm (estimated) for up to 30 minutes

> 700 ppm 4 hours/day for 4 days

> 700 ppm intermittently 2-8 weeks

OBSERVED EFFECT

Nausea, stomach spasms, lightheadedness, temporary unconsciousness and seizures. Random twitching of the muscles, nausea and tiredness occurred over the next 24 hours. Full recovery occurred within 3 weeks.

Headache and diarrhea, which disappeared in 70 hours. Additional symptoms included mouth dryness, dizziness and weakness. Symptoms persisted up to 21 days.

Persistent non-allergic asthma (reactive airways syndrome), with symptoms of coughing, wheezing and shortness of breath. Impaired lung function has occurred in individuals exposed at this level, due to scarring of the lungs (pulmonary fibrosis).

Peripheral neuropathy with headache, weakness in the extremities, incoordination and irregular gait.

SKIN and EYE CONTACT: Due to the presence of Ethylene Oxide in this gas mixture, over-exposures to the eyes may cause irritation (i.e. redness, stinging). The Ethylene Oxide component of this gas mixture can be absorbed via intact skin, causing effect described under "inhalation". Chronic skin contact may cause dermatitis (dry, red, cracked skin).

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM	
HEALTH HAZARD (BLUE)	2
FLAMMABILITY HAZARD (RED)	0
PHYSICAL HAZARD (YELLOW)	0
PROTECTIVE EQUIPMENT	
EYES	RESPIRATORY
HANDS	BODY
See Section 8	
For Routine Industrial Use and Handling Applications	

3. HAZARD IDENTIFICATION (Continued)

OTHER HEALTH EFFECTS: The Ethylene Oxide component is considered a known human carcinogen and possible reproductive toxin. All contact with this gas mixture should be avoided. Several studies have reported nervous system effects in employees exposed to less than 1 to 4.7 ppm (8-hour time-weighted average), with daily short-term peaks of 250 to 700 ppm for 0.5 to 20 years. Damage to the nerves which provide feeling and movement in the extremities (peripheral neuropathy) is most commonly observed. Symptoms include numbness in the feet and fingers, muscular weakness in the lower limbs, reduced hand-eye coordination, reduced nerve velocity in the calf muscle, and nerve fiber effects. Many of the studies are limited by factors such as the small number of employees studied and incomplete exposure information. No conclusions can be drawn from a case report of long-term low-level exposure (4.2 ppm, 8-hour time-weighted average; 10 years) involving sterilization of equipment with Ethylene Oxide. This report suggested Ethylene Oxide exposure was related to impaired thinking ability and sensory loss.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to this gas mixture may cause the following health effects:

ACUTE: Due to the small size of the individual cylinder of this gas mixture, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. The most significant hazard associated with this gas mixture is the potential for exposure to oxygen-deficient atmospheres. Symptoms of oxygen deficiency include respiratory difficulty, ringing in ears, headaches, shortness of breath, wheezing, headache, dizziness, indigestion, nausea, unconsciousness, and death. The skin of a victim of over-exposure may have a blue color. Due to the presence of Ethylene Oxide (≤ 200 ppm) in this gas mixture, inhalation over-exposures may cause upper respiratory system and eye irritation. Additionally, inhalation over-exposures to low levels of Ethylene Oxide can cause nausea, vomiting, and numbing of the sense of smell.

CHRONIC: Some studies involving chronic exposure to low levels of Ethylene Oxide suggest that permanent damage to the peripheral nervous system may occur. There is conflicting evidence that Ethylene Oxide may cause skin and/or respiratory sensitization. Due to the presence of Ethylene Oxide, this gas mixture must be considered a potential carcinogen and reproductive hazard to humans. Chronic exposure to oxygen-deficient atmospheres (below 18% oxygen in air) may affect the heart and nervous system. Refer to Section 11 (Toxicology Information) for more data.

TARGET ORGANS: ACUTE: Respiratory system, skin, eyes. CHRONIC: Reproductive system, skin, peripheral nervous system, heart, central nervous system.

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS GAS MIXTURE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus must be worn.

No unusual health effects are anticipated after exposure to this gas mixture, due to the small cylinder size. If any adverse symptom develops after over-exposure to this gas mixture, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary. Victim(s) who experience any adverse effect after over-exposure to this gas mixture must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of the label and the MSDS to physician or other health professional with victim(s).

EYE EXPOSURE: If irritation of the eye develops after exposure to this gas mixture, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Seek medical assistance if irritation continues after the conclusion of flushing, or other adverse effects occur.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Eye conditions and respiratory disorders may be aggravated by over-exposure to this gas mixture.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms; eliminate exposure. Refer to the OSHA Ethylene Oxide Standard (29 CFR 1910.1047; Paragraph K and Appendix A) for specific information on Medical Surveillance requirements (i.e. for the general physical exam, medical history, serum specimens, specific tests, and re-examination protocol).

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): Not applicable.

Upper (UEL): Not applicable.

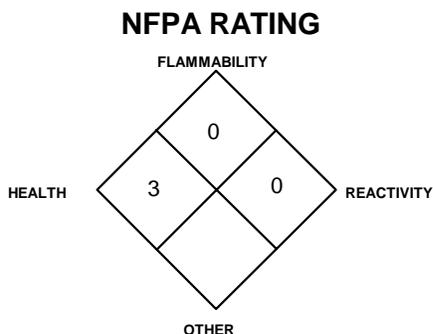
FIRE EXTINGUISHING MATERIALS: Non-flammable gas mixture. Use extinguishing media appropriate for surrounding fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment.



6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Due to the small size and content of the cylinder, an accidental release of this gas mixture presents significantly less risk of over-exposure to Ethylene Oxide, an oxygen deficient environment, or other safety hazards than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediate area. Such releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel. Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for levels of Ethylene Oxide and Oxygen. The level of Ethylene Oxide must be at acceptable levels (see Section 2, Composition on Information on Ingredients) and the atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus. If leaking incidentally from the cylinder, contact your supplier.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms, due to oxygen deficiency. Do not attempt to repair, adjust, or in any other way modify the cylinders containing this gas mixture. If there is a malfunction or another type of operational problem, contact nearest distributor immediately.

NOTE: Refer to the OSHA Ethylene Oxide Standard (29 CFR 1910.1047) for specific requirements associated with the use of this gas. The Action Level for Ethylene Oxide is 0.5 ppm. In workplaces where employees are exposed above the Action Level, the OSHA requirements for monitoring, established of regulated areas, methods of compliance, respiratory protection, emergency response protocol, medical surveillance, training, and record-keeping must be followed.

STORAGE AND HANDLING PRACTICES: Entrances to regulated areas (as defined by the OSHA Ethylene Oxide Standard, 29 CFR 1910.1047) must be posted with legible signs which read as follows:

**DANGER
ETHYLENE OXIDE
CANCER HAZARD AND REPRODUCTIVE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING MAY BE REQUIRED TO BE
WORN IN THIS AREA**

Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment, and preferably kept at room temperature (approximately 21°C; 70°F). Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage. Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. **WARNING! Do not refill DOT 39 cylinders. To do so may cause personal injury or property damage.**

7. HANDLING and USE (Continued)

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: WARNING! Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this gas mixture in well-ventilated areas. If this gas mixture is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of oxygen.

RESPIRATORY PROTECTION: Maintain exposure levels of Ethylene Oxide below the levels listed in Section 2 (Composition and Information on Ingredients) and Oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection if Ethylene Oxide levels exceed exposure limits and if Oxygen level is below 19.5% or during emergency response to a release of this gas mixture. If respiratory protection is required for emergency response to this gas mixture, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134) or equivalent State standards. The following are NIOSH recommendations for respiratory protection for concentration of Ethylene Oxide in air.

ETHYLENE OXIDE CONCENTRATION

Up to 5 ppm:

RESPIRATORY PROTECTION

Any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against Ethylene Oxide (end of service life indicator (ESLI) required), or any Self-Contained Breathing Apparatus (SCBA) with a full facepiece, or any Supplied-Air Respirator (SAR) with a full facepiece.

Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions: Any Self-Contained Breathing Apparatus (SCBA) that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode, or any SAR that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.

Escape: Any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister, or any appropriate escape-type, SCBA.

NOTE: Follow the specific respiratory selection guidelines of the OSHA Ethylene Oxide Standard in regulated areas (as defined by 29 CFR 1910.1047).

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Wear leather gloves when handling cylinders. Chemically resistant gloves should be worn when using this gas mixture. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: No special protection is needed under normal circumstances of use. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for Nitrogen, the main component of this gas mixture.

GAS DENSITY @ 32°F (0°C) and 1 atm: .072 lbs/ ft³ (1.153 kg/m³)

FREEZING/MELTING POINT @ 10 psig: -345.8°F (-210°C)

SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 0.906

SOLUBILITY IN WATER vol/vol @ 32°F (0°C) and 1 atm: 0.023

EVAPORATION RATE (nBuAc = 1): Not applicable.

VAPOR PRESSURE @ 70°F (21.1°C) (psig): Not applicable.

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

BOILING POINT: -320.4°F (-195.8°C)

pH: Not applicable.

MOLECULAR WEIGHT: 28.01

EXPANSION RATIO: Not applicable.

SPECIFIC VOLUME (ft³/lb): 13.8

The following information is for this gas mixture.

APPEARANCE, ODOR AND COLOR: This gas mixture is a colorless, odorless gas.

HOW TO DETECT THIS SUBSTANCE (warning properties): Fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by bubble formation.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state.

DECOMPOSITION PRODUCTS: The thermal decomposition products of Ethylene Oxide include carbon oxides. Nitrogen does not decompose, per se, but can react with other compounds in the heat of a fire.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Titanium will burn in Nitrogen (the main component of this gas mixture). Lithium reacts slowly with Nitrogen at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur. Ethylene Oxide can undergo violent polymerization in the presence of an initiating agent (i.e. acids, alcohols, bases, and metals); however, due to this component's low concentration in the gas mixture, this is not anticipated to be a significant safety hazard.

CONDITIONS TO AVOID: Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology data are available for the components of this gas mixture:

ETHYLENE OXIDE:

Standard Draize Test (Skin-Human) 1%/7 seconds

Standard Draize Test (Eye-Rabbit) 18 mg/6 hours:

Moderate

TCLo (Inhalation-Human) 12,500 ppm/10 seconds:

Sense Organs and Special Senses (Olfaction): effect, not otherwise specified

TCLo (Inhalation-Woman) 500 ppm/2 minutes:

Behavioral: convulsions or effect on seizure threshold; Gastrointestinal: nausea or vomiting; Lungs, Thorax, or Respiration: other changes

LD₅₀ (Oral-Rat) 72 mg/kg

LD₅₀ (Oral-Guinea Pig) 270 mg/kg

LD₅₀ (Subcutaneous-Rat) 187 mg/kg

LD₅₀ (Intraperitoneal-Mouse) 175 mg/kg

LD₅₀ (Intravenous-Mouse) 290 mg/kg

LD₅₀ (Intravenous-Dog) 330 mg/kg: Sense Organs and Special Senses (Eye): effect, not otherwise specified; Behavioral: convulsions or effect on seizure threshold; Gastrointestinal: nausea or vomiting

LC₅₀ (Inhalation-Rat) 800 ppm/4 hours: Lungs, Thorax, or Respiration: other changes; Liver: other changes; Kidney, Ureter, Bladder: other changes

LC₅₀ (Inhalation-Mouse) 836 ppm/4 hours

LC₅₀ (Inhalation-Dog) 960 ppm/4 hours: Sense Organs and Special Senses (Eye): lacrimation; Gastrointestinal: nausea or vomiting, hypermotility, diarrhea

ETHYLENE OXIDE (continued):

LC₅₀ (Inhalation-Guinea Pig) 1500 mg/m³/4 hours

LDLo (Unreported-Rat) 200 mg/kg: Lungs, Thorax, or Respiration: other changes; Liver: other changes; Kidney, Ureter, Bladder: other changes

LDLo (Subcutaneous-Cat) 100 mg/kg

LDLo (Intravenous-Rabbit) 175 mg/kg: Sense Organs and Special Senses (Eye): effect, not otherwise specified; Behavioral: muscle weakness, rigidity (including catalepsy)

TCLo (Inhalation-Rat) 406 ppm/6 hours/6 weeks-intermittent: Nutritional and Gross Metabolic: weight loss or decreased weight gain; Related to Chronic Data: death

TCLo (Inhalation-Rat) 300 µg/m³/24H/83 days-continuous: Behavioral: muscle contraction or spasticity; Blood: other changes; Nutritional and Gross Metabolic: changes in chlorine

TCLo (Inhalation-Rat) 33 ppm/6 hours/2 years-intermittent: Tumorigenic: Carcinogenic by RTECS criteria; Brain and Coverings: tumors; Blood: leukemia

TCLo (Inhalation-Rat) 100 ppm/6 hours: female 6-15 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus)

ETHYLENE OXIDE (continued):

TCLo (Inhalation-Rat) 100 ppm/6 hours: male 12 week(s) pre-mating female 9 week(s) pre-mating: 3 week(s) after conception: Reproductive: Effects on Newborn: live birth index (measured after birth)

TCLo (Inhalation-Rat) 3600 µg/m³/24 hours: male 60 day(s) pre-mating: Reproductive: Paternal Effects: testes, epididymis, sperm duct; Fertility: pre-implantation mortality (e.g. reduction in number of implants per female; total number of implants per corpora lutea)

TCLo (Inhalation-Rat) 100 ppm/6 hours: female 12 week(s) pre-mating: 21 day(s) after conception: Reproductive: Fertility, pre-implantation mortality (e.g. reduction in number of implants per female; total number of implants per corpora lutea); Effects on Newborn: live birth index (measured after birth)

TCLo (Inhalation-Rat) 150 ppm/7 hours: female 7-16 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus); Specific Developmental Abnormalities: craniofacial (including nose and tongue), musculoskeletal system

TCLo (Inhalation-Mouse) 50 ppm/6 hours/2 years: Tumorigenic: Carcinogenic by RTECS criteria; Lungs, Thorax, or Respiration: tumors

11. TOXICOLOGICAL INFORMATION (Continued)

TOXICITY DATA (continued):

ETHYLENE OXIDE (continued):

TCLo (Inhalation-Mouse) 400 ppm/6 hours/13 weeks-intermittent: Kidney, Ureter, Bladder: changes in bladder weight; Blood: normocytic anemia; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: hepatic microsomal mixed oxidase (dealkylation, hydroxylation, etc.)

TCLo (Inhalation-Mouse) 600 ppm/6 hours/14 weeks-intermittent: Sense Organs and Special Senses (Olfaction): effect, not otherwise specified; Endocrine: other changes; Related to Chronic Data: death

TCLo (Inhalation-Mouse) 450 mg/m³/6 hours/10 weeks-intermittent: Liver: changes in liver weight; Endocrine: changes in spleen weight; Related to Chronic Data: changes in testicular weight

TCLo (Inhalation-Mouse) 255 ppm/6 hours: male 10 day(s) pre-mating: Reproductive: Effects on Embryo or Fetus: fetal death

TCLo (Inhalation-Mouse) 1200 ppm/90 minutes: female 1 day(s) after conception: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants); Effects on Embryo or Fetus: fetal death; Specific Developmental Abnormalities: homeostasis

TCLo (Inhalation-Mouse) 1200 ppm/90 minutes: female 1 day(s) pre-mating: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants); Effects on Embryo or Fetus: fetal death, other effects to embryo

TCLo (Inhalation-Mouse) 2700 ppm/6 hours: female 7 day(s) after conception: Reproductive: Effects on Embryo or Fetus: other effects to embryo

TCLo (Inhalation-Dog) 290 ppm/6 hours/6 weeks-intermittent: Blood: pigmented or nucleated red blood cells, changes in erythrocyte (RBC) count

TCLo (Inhalation-Dog) 102 ppm/26 weeks-intermittent: Blood: pigmented or nucleated red blood cells, changes in erythrocyte (RBC) count

TCLo (Inhalation-Monkey) 100 ppm/7 hours/2 years-intermittent: Sense Organs and Special Senses (Eye): effect, not otherwise specified

ETHYLENE OXIDE (continued):

TCLo (Inhalation-Monkey) 50 ppm/7 hours: male 96 week(s) pre-mating: Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count)

TCLo (Inhalation-Monkey) 50 ppm/7 hours: male 2 year(s) pre-mating: Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count)

TDLo (Oral-Rat) 1186 mg/kg/2 years-intermittent: Tumorigenic: Carcinogenic by RTECS criteria; Gastrointestinal: tumors; Liver: tumors

TDLo (Subcutaneous-Mouse) 292 mg/kg/95 weeks-intermittent: Tumorigenic: Carcinogenic by RTECS criteria; Blood: lymphoma, including Hodgkin's disease; Tumorigenic: tumors at site of application

TDLo (Intraperitoneal-Mouse) 750 mg/kg: male 25 day(s) pre-mating: Reproductive: Effects on Newborn: live birth index (measured after birth), delayed effects

TDLo (Intraperitoneal-Mouse) 125 mg/kg: female 1 day(s) after conception: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants), litter size (e.g. # fetuses per litter; measured before birth); Specific Developmental Abnormalities: eye/ear

TDLo (Intraperitoneal-Mouse) 125 mg/kg: female 1 day(s) after conception: Reproductive: Specific Developmental Abnormalities: musculoskeletal system, other developmental abnormalities

TDLo (Intravenous-Mouse) 225 mg/kg: female 10-12 day(s) after conception: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants)

TDLo (Intravenous-Mouse) 450 mg/kg: female 8-10 day(s) after conception: Reproductive: Specific Developmental Abnormalities: musculoskeletal system

TDLo (Intravenous-Mouse) 450 mg/kg: female 10-12 day(s) after conception: Reproductive: Fertility: litter size (e.g. # fetuses per litter; measured before birth); Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus)

ETHYLENE OXIDE (continued):

TDLo (Intraperitoneal-Mouse) 150 mg/kg: male 1 day(s) pre-mating: Reproductive: Effects on Embryo or Fetus: fetal death

TDLo (Intravenous-Rabbit) 324 mg/kg: female 6-14 day(s) after conception: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants)

TD (Subcutaneous-Mouse) 1090 mg/kg/91 weeks-intermittent: Tumorigenic: neoplastic by RTECS criteria; Blood: lymphoma, including Hodgkin's disease; Tumorigenic: tumors at site of application

TD (Subcutaneous-Mouse) 908 mg/kg/95 weeks-intermittent: Tumorigenic: Carcinogenic by RTECS criteria; Blood: lymphoma, including Hodgkin's disease; Tumorigenic: tumors at site of application

TD (Subcutaneous-Mouse) 2576 mg/kg/95 weeks-intermittent: Tumorigenic: Carcinogenic by RTECS criteria; Blood: lymphoma, including Hodgkin's disease; Tumorigenic: tumors at site of application

TD (Oral-Rat) 5112 mg/kg/2 years-intermittent: Tumorigenic: Carcinogenic by RTECS criteria; Gastrointestinal: tumors; Liver: tumors

TC (Inhalation-Rat) 50 ppm/7 hours/2 years-intermittent: Tumorigenic: Carcinogenic by RTECS criteria; Blood: tumors

TC (Inhalation-Rat) 33 ppm/6 hours/2 years-intermittent: Tumorigenic: equivocal tumorigenic agent by RTECS criteria; Brain and Coverings: tumors

TC (Inhalation-Rat) 33 ppm/6 hours/2 years-intermittent: Tumorigenic: Carcinogenic by RTECS criteria; Brain and Coverings: tumors

Mutation in Microorganisms (*Salmonella typhimurium*) 40 µmol/plate

ETHYLENE OXIDE (continued):

Mutation in Microorganisms (*Salmonella typhimurium*) 20 ppm

Mutation in Microorganisms (*Escherichia coli*) 3500 µmol/10 hours

Mutation in Microorganisms (Microorganism-not otherwise specified) 540 mg/L

Specific Locus Test (Parenteral-*Drosophila melanogaster*) 114 mmol/L

NITROGEN: There are no specific toxicology data for Nitrogen. Nitrogen is a simple asphyxiant, which acts to displace oxygen in the environment.

SUSPECTED CANCER AGENT: The components of this gas mixture are listed by agencies tracking the carcinogenic potential of chemical compounds, as follows:

ETHYLENE OXIDE: ACGIH TLV-A2 (Suspected Human Carcinogen); IARC-1 (Carcinogenic to Humans); MAK-2 (Substances That are Considered to Be Carcinogenic for Man Because Sufficient Data from Long-Term Animal Studies or Limited Evidence from Animal Studies Substantiated by Evidence from Epidemiological Studies Indicate that They Can Make a Significant Contribution to Cancer Risk); NIOSH-Ca (Potential Occupational Carcinogen with No Further Categorization); NTP-K (Known to Be a Human Carcinogen); OSHA-Ca (Carcinogen Defined with No Further Categorization). Ethylene Oxide has been associated with malignancies of the lymphatic and hematopoietic system in both human and experimental animals.

Nitrogen is not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and IARC; therefore, it is not considered to be, nor suspected to be, a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: This gas mixture may be irritating to contaminated eyes and the upper respiratory system.

SENSITIZATION TO THE PRODUCT: There is conflicting evidence that Ethylene Oxide may cause skin and/or respiratory sensitization.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this gas mixture and its components on the human reproductive system.

Mutagenicity: Human mutation data are available for the Ethylene Oxide component of this gas mixture. Extensive testing has shown that Ethylene Oxide is a powerful mutagen. Positive results, including somatic cell mutations and gene mutations and heritable translocations in rodent germ cells, have been obtained in numerous studies. Ethylene Oxide is often used as a positive control in mutagenicity tests. It is regarded as a direct mutagen, which means that metabolic activation is not required.

Embryotoxicity: No embryotoxic effects have been described for the components of this gas mixture.

Teratogenicity: There is substantial evidence which demonstrates that the Ethylene Oxide component of this gas mixture is an experimental teratogen in animals.

Reproductive Toxicity: Exposure to the Ethylene Oxide component of this gas mixture has been demonstrated to cause reproductive toxicity in both humans and animals.

A **mutagen** is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An **embryotoxin** is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A **teratogen** is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A **reproductive toxin** is any substance which interferes in any way with the reproductive process.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) have not been determined for the components of this gas mixture.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The gas will be dissipated rapidly in well-ventilated areas. The following environmental data are applicable to the components of this gas mixture.

NITROGEN: Water Solubility = 2.4 volumes Nitrogen/100 volumes water at 0°C. 1.6 volumes Nitrogen/100 volumes water at 20°C.

ETHYLENE OXIDE:

Terrestrial Fate: When released on land, Ethylene Oxide would tend to volatilize rapidly. Ethylene Oxide is miscible in water and poorly adsorbed to soil so leaching is likely to occur. Although experimental data are lacking, hydrolysis in soil is probable.

Aquatic Fate: When released into water Ethylene Oxide will primarily be lost by three processes: volatilization, hydrolysis and biodegradation in that order of importance. Volatilization will depend on wind and mixing conditions and would be expected to occur in hours to days. The volatilization half-lives of Ethylene Oxide in a model river and lake are 5.9 hr and 3.8 days, respectively. The half-life for hydrolysis is 9-14 days leading to biodegradable products. Because of the limited data, it is difficult to estimate the rate of biodegradation; the available data would suggest that the biodegradation rate is slower than the volatilization and hydrolysis rates. Ethylene Oxide would not tend to adsorb to sediment. In groundwater, ethylene oxide will degrade due to hydrolysis.

Atmospheric Fate: Ethylene oxide will degrade in the atmosphere primarily by reaction with photochemically produced hydroxyl radicals. Assuming a hydroxyl radical concentration of 5X10⁵ radicals/cu cm, the half-life of Ethylene Oxide in the atmosphere will be 211 days. Data suggests that neither rain out nor adsorption into aqueous aerosols in the air should remove much of this compound.

Bioconcentration: Although no studies of bioconcentration for Ethylene Oxide were found in the literature, one would not expect it to bioconcentrate due to its low octanol/water partition coefficient (log Kow= -0.3).

12. ECOLOGICAL INFORMATION (Continued)

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on the effects of this gas mixture on plant and animal life.
EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this gas mixture's effects on aquatic life. The following aquatic toxicity data are available for the Ethylene Oxide component of this gas mixture:

ETHYLENE OXIDE:	ETHYLENE OXIDE (continued):
LC ₅₀ (Goldfish) 24 hours = 90 mg/L (ASTM D 1345)	LC ₅₀ (<i>Artemia salina</i>) 24 hours = 350-570 mg/l)
LC ₅₀ (<i>Daphnia magna</i>) 24 hours = 260-300 mg/L	LC ₅₀ (<i>Artemia salina</i>) 48 hours = 490-1,000 mg/L
LC ₅₀ (<i>Daphnia magna</i>) 48 hours = 137-300 mg/L	LC ₅₀ (<i>Pimephales promelas</i>) 96 hours = 84 mg/L

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

14. TRANSPORTATION INFORMATION

THIS GAS MIXTURE IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (Ethylene Oxide, Nitrogen)
HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
UN IDENTIFICATION NUMBER: UN 1956
PACKING GROUP: Not applicable.
DOT LABEL(S) REQUIRED: Non-Flammable Gas

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 126

MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

Note: DOT 39 Cylinders ship in a strong outer carton (overpack). Pertinent shipping information goes on the outside of the overpack. DOT 39 Cylinders do not have transportation information on the cylinder itself.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas is considered as Dangerous Goods, per regulations of Transport Canada.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (Ethylene Oxide, Nitrogen)
HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
UN IDENTIFICATION NUMBER: UN 1956
PACKING GROUP: Not Applicable
HAZARD LABEL: Class 2.2 (Non-Flammable Gas)
SPECIAL PROVISIONS: None
EXPLOSIVE LIMIT AND LIMITED QUANTITY INDEX: 0.12
ERAP INDEX: None
PASSENGER CARRYING SHIP INDEX: None

PASSENGER CARRYING ROAD VEHICLE OR PASSENGER CARRYING RAILWAY VEHICLE INDEX: 75

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 121

NOTE: Shipment of compressed gas cylinders via Public Passenger Road Vehicle is a violation of Canadian law (Transport Canada Transportation of Dangerous Goods Act, 1992).

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: This gas mixture is subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Ethylene Oxide	YES	YES	YES

U.S. SARA THRESHOLD PLANNING QUANTITY: Ethylene Oxide = 1,000 pounds.

U.S. TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Ethylene Oxide = 10 pounds.

OTHER U.S. FEDERAL REGULATIONS:

- Ethylene Oxide is subject to the requirements of CFR 29 1910.1000. This component is listed in Table Z.1. Ethylene Oxide is also regulated under 29 CFR 1910.1047.
Due to the presence of Ethylene Oxide in this gas mixture, requirements of the Ethylene Oxide Standard, 29 CFR 1910.1047 must be met.
- Depending on specific operations involving the use of Ethylene Oxide, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Ethylene Oxide is listed in Appendix A of this regulation. The threshold quantity for Ethylene Oxide under this regulation is 5000 pounds. Due to the small size of the cylinder for this mixture, this regulation should not apply.
- Ethylene Oxide is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for Ethylene Oxide is 10,000 pounds. Due to the small size of the cylinder for this mixture, this regulation should not apply.
- This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).
- Nitrogen is not listed as a Regulated Substance, per 40 CFR, Part 68, of the Risk Management for Chemical Releases. Ethylene Oxide is listed under this regulation in Table 3 as a Regulated Substance (Toxic Substance), in quantities of 10,000 lbs (4,553 kg) or greater. Due to the small size of the cylinder for this mixture, this regulation should not apply.

U.S. STATE REGULATORY INFORMATION: The components of this gas mixture are covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: Ethylene Oxide.	Massachusetts - Substance List: Ethylene Oxide.	Pennsylvania - Hazardous Substance List: Nitrogen, Ethylene Oxide.
California - Permissible Exposure Limits for Chemical Contaminants: Nitrogen, Ethylene Oxide.	Minnesota - List of Hazardous Substances: Ethylene Oxide.	Rhode Island - Hazardous Substance List: Nitrogen, Ethylene Oxide.
Florida - Substance List: Ethylene Oxide.	Missouri - Employer Information/Toxic Substance List: Ethylene Oxide.	Texas - Hazardous Substance List: Ethylene Oxide.
Illinois - Toxic Substance List: Ethylene Oxide.	New Jersey - Right to Know Hazardous Substance List: Nitrogen, Ethylene Oxide.	West Virginia - Hazardous Substance List: Ethylene Oxide.
Kansas - Section 302/313 List: Ethylene Oxide.	North Dakota - List of Hazardous Chemicals, Reportable Quantities: Ethylene Oxide.	Wisconsin - Toxic and Hazardous Substances: Ethylene Oxide.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Ethylene Oxide is on the Proposition 65 lists. **WARNING:** Contains a chemical known to the State of California to cause cancer, birth defects, and other reproductive harm.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDL INVENTORY STATUS: The components of this gas mixture are listed on the DSL Inventory.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of this gas mixture are not on the CEPA Priorities Substances Lists.

CANADIAN WHMIS CLASSIFICATION: This gas mixture is categorized as a Controlled Product, Hazard Classes A and D2A, as per the Controlled Product Regulations.

16. OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable or oxidizing gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. CALGAZ will do this for any customer that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scrapping cylinders involves some preparation before the metal dealer may accept them. We perform this operation as a service to valued customers who want to participate.

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information about the handling of compressed gases can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703) 412-0900.

P-1 *"Safe Handling of Compressed Gases in Containers"*
AV-1 *"Safe Handling and Storage of Compressed Gases"*
 "Handbook of Compressed Gases"

PREPARED BY: CHEMICAL SAFETY ASSOCIATES, Inc.
 PO Box 3519, La Mesa, CA 91944-3519
 619/670-0609
 Fax on Demand: 1-800/231-1366



This Material Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard, 29 CFR, 1910.1200. Other government regulations must be reviewed for applicability to this gas mixture. To the best of CALGAZ knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness are not guaranteed and no warranties of any type, either express or implied, are provided. The information contained herein relates only to this specific product. If this gas mixture is combined with other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition.

Material Safety Data Sheet

Product No. 18420, 18421, 18422 Glutaraldehyde, 8%

Issue Date (06-15-06)

Review Date (04-06-07)

Section 1: Product and Company Identification

Product Name: Glutaraldehyde, 8%

Synonym: Glutaral, Glutaric Dialdehyde

Chemical Family: Aldehydes

Company Name

Ted Pella, Inc. and PELCO International, P.O. Box 492477, Redding, CA96049-2477

Domestic Phone (800) 237-3526 (Mon-Thu. 6:00AM to 4:30PM PST; Fri 6:00AM to 4:00PM PST)

International Phone (01) (530) 243-2200 (Mon-Thu. 6:00AM to 4:30PM PST; Fri 6:00AM to 4:00PM PST)

Chemtrec Emergency Number 1-800-424-9300 24 hrs a day.

Section 2: Composition / Information on Ingredients

Principle Hazardous Component(s) (chemical and common name(s)) (Cas. No)	%	OSHA CEILING mg/m3	ACGIH CEILING mg/m3	OSHA TWA mg/m3	ACGIH TWA mg/m3	NTP	IARC	OSHA regulated
Glutaraldehyde (111-30-8)	8	0.8 0.2ppm	0.2* 0.05ppm*	NE	NE	No	No	No
Water (7732-18-5)	<92 .5	NE	NE	NE	NE	No	No	No
Methanol (67-56-1)	0.5	NE	NE	260	262	No	No	No

*HI State: Activated and Inactivated.

Section 3: Hazard Identification

Emergency overview

Appearance: Transparent, colorless liquid.

Immediate effects: Danger! Corrosive. Causes irreversible eye damage. Cause skin burns. Maybe fatal if swallowed. Prolonged or frequently repeated skin contact may cause allergic reaction in some individuals. Plastic container, if present, may cause static ignition hazard. Aspiration may cause lung damage. Causes asthmatic signs and symptoms in hyper-reactive individuals.

Potential health effects

Primary Routes of entry: Inhalation, ingestion, and skin and eye contact.

Signs and Symptoms of Overexposure:

Eyes: Liquid will cause severe and persistent conjunctivitis, seen as excess redness and marked swelling of the conjunctiva and profuse discharge. Severe corneal injury may develop, which could permanently impair vision if prompt first-aid and medical treatment not obtained. Vapor will cause stinging sensations in the eye with excess tear production, blinking and possibly a slight excess of redness of the conjunctiva. Skin: Brief contact will cause itching with mild to moderate local redness and possibly swelling. Prolong contact may result in pain, severe redness and swelling with ulceration, tissue destruction and possibly bleeding into the inflamed area. Contact with solutions of Glutaraldehyde may cause harmless yellow or

brownish coloration of skin. Skin Absorption: Prolonged or widespread contact may result in the absorption of potentially harmful amounts of material.

Ingestion: Moderately toxic. May cause moderate to marked irritation and possibly chemical burns of the mouth, throat, esophagus and stomach. There will be discomfort or pain in the chest and abdomen, nausea, vomiting, diarrhea, dizziness, faintness, drowsiness, thirst, weakness, circulator shock, collapse and coma. Aspiration into the lungs may occur during ingestion or vomiting, resulting in lung injury.

Inhalation: Vapor is irritating to the respiratory tract, causing stinging sensations in the nose and throat, discharge from nose, possibly bleeding from the nose, coughing, chest discomfort and tightness, difficulty with breathing and headache. Heating the solution may result in more severe irritant effects.

Chronic Exposure: Repeated skin contact may cause a cumulative dermatitis. May cause skin sensitization in a small portion of individuals and present as an allergic contact dermatitis. This usually results from contact with the liquid, but occasionally there may be a reaction to Glutaraldehyde vapor.

Will cause signs and symptoms of an asthmatic attack in hyper-reactive individuals.

Chemical Listed As Carcinogen Or Potential Carcinogen:

See Toxicological Information (Section 11)

Potential environmental effects

See Ecological Information (Section 12)

Section 4: First Aid Measures

If accidental overexposure is suspected

Eye(s) Contact: Immediately flush eyes with water and continue washing for at least 15 minutes. DO NOT remove contact lenses, if worn. Obtain medical attention without delay, preferably from an ophthalmologist.

Skin Contact: Immediately remove contaminated clothing and shoes. Wash skin with soap and water. Obtain medical attention. Wash clothing before reuse. Discard contaminated leather articles such as shoes and belt.

Inhalation: Remove to fresh air. Give artificial respiration if not breathing. If breathing is difficult, oxygen may be given by qualified professional. Obtain medical attention.

Ingestion: DO NOT INDUCE VOMITING. Do not give anything to drink. Obtain medical attention immediately.

Note to physician

Treatment: The hazards of this material are due mainly to its severely irritant properties on skin and mucosal surfaces. Moderately toxic by swallowing. Moderately toxic by absorption across the skin. Due to the severely irritating or corrosive nature of the material, swallowing may lead to ulceration and inflammation of the upper alimentary tract with hemorrhage and fluid loss. Also, perforation of the esophagus or stomach may occur, leading to mediastinitis or peritonitis and the resultant complications. Any material aspirated during vomiting may cause lung injury. Therefore, emesis should not be induced mechanically or pharmacologically. If it is considered necessary to evacuate the stomach contents, this should be done by means least likely to cause aspiration (e.g., gastric lavage after endotracheal intubation).

Medical Conditions generally Aggravated by Exposure: Skin contact may aggravate an existing dermatitis. Inhalation of material may aggravate asthma and inflammatory of fibrotic pulmonary disease.

Section 5: Fire Fighting Measures

Flash Point: ND

Flammable Limits: ND

Auto-ignition point: ND

Fire Extinguishing Media: Non-flammable (aqueous solution). After water evaporates, remaining material will burn. Use alcohol-type or dl-purpose-type foam, applied by manufacturer's recommended techniques for large fires. Use carbon dioxide in sufficient concentrations can act as an asphyxiant.

Special Fire Fighting Procedures: Use self-contained breathing apparatus and protective clothing.

Unusual Fire and Explosion Hazards: None known.

Hazardous combustion products: Carbon monoxide, carbon dioxide.

DOT Class: None

Section 6: Accidental Release Measures

Steps to be Taken in Case Material is Released or Spilled: Very low concentrations (5 ppm or less of Glutaraldehyde) can be degraded in a biological waste water treatment system. Small spills can be flushed with large amounts of water. Large Spills: Material should be collected for disposal. It may also be possible to decontaminate spilled material by careful application of sodium hydroxide, ammonium or sodium bisulfate. Depending on conditions, considerable heat and fumes can be liberated by decontamination of reaction. Toxic to fish; avoid discharge to natural waters.

Waste Disposal Methods: Dispose of waste according to Federal, State and Local Regulations.

Section 7: Handling and Storage

Precautions to be Taken in Handling and Storage: Must not be used in the form of a spray or aerosol. Do not get in eyes, on skin or clothing. Avoid breathing vapors. Do not swallow. Do not handle or empty in presence of flammable vapor. Wear goggles, protective clothing and gloves. Wash thoroughly with soap and water after handling. Remove contaminated clothing and wash before reuse. Keep container closed and use adequate ventilation.

Storage temperature: ND

Storage Pressure: ND

Section 8: Exposure Controls / Personal Protection

Engineering Controls

Ventilation required: General mechanical room ventilation is expected to be satisfactory if this material is kept in covered equipment or if the solution is highly diluted. However, if vapors are strong enough to be irritating to the nose or eyes, the TLV is probably being exceeded and special ventilation is required.

Personal Protection Equipment

Respiratory protection: Use self-contained breathing apparatus in high vapor concentrations. If apparatus is not available, a MSHA/NIOSH approved air purifying respirator equipped with an organic vapor cartridge should be used.

Protective gloves: Polyethylene, Nitrile (NBR) or Butyl gloves must be worn.

Skin protection: Wear protective chemical apron and rubber boots.

Eye protection: Splash proof mono-goggles or safety glasses with side shields in conjunction with face shield.

Additional clothing and/or equipment: Eye bath and safety shower.

Exposure Guidelines

See Composition/Information on Ingredients (Section2)

Section 9 Physical and Chemical Properties

Appearance and Physical State: Transparent, colorless liquid.

Odor (threshold): Sharp, fruity, medicinal.

Specific Gravity (H₂O=1): 1.129 @ 20 °C

Vapor Pressure (mm Hg): 0.03 kPa active ingredient (0.20 mmHg active ingredient)

Vapor Density (air=1): 1.1

Percent Volatile by volume: ND

Evaporation Rate (butyl acetate=1): 1

Boiling Point: 100.5 °C (213 °F) as product.

Freezing point / melting point: -21 °C (-6 °F)

pH: ND

Solubility in Water: 100% @ 20 °C
Molecular Weight: 100.11 g/mol
Chemical Formula: OHCC₃H₆CHO

Section 10: Stability and Reactivity

Stability: Stable

Conditions to Avoid: High temperatures above 100 °C and evaporation of water.

Materials to Avoid (Incompatibility): Strong alkalis and acids catalyze on aldol-type condensation exothermic, but not expected to be violent).

Hazardous Decomposition Products: ND

Hazardous Polymerization: Will not occur under 100 °C. However, if it does occur, it is not hazardous.

Section 11: Toxicological Information

Results of component toxicity test performed: Acute Toxicity: Peroral, Rat (female), LD50: 154 (116-206) mg/kg. Major signs: sluggishness, lacrimation, diarrhea, piloerection, perinasal encrustation. Gross pathology: lungs, stomach, intestines discolored. Peroral, Rat (Male) LD50: 246 (179-339) mg/kg. Major signs: sluggishness, lacrimation, diarrhea, piloerection, perinasal encrustation. Gross pathology: lungs, stomach, intestines discolored. Percutaneous, Rabbit (24hrs occluded) LD50: 2.54 (1.46-4.41) ml/kg.

Major signs: necrosis at application site. Gross pathology: lungs, livers, spleen and kidneys discolored.

Inhalation, Rat(Female): Dynamic generation of vapor.

Exposure Time: 4 hrs 163 ppm

Kill Rate: 0/5

Major Signs: Blepharospasm, periocular wetness, audible respiration.

Gross Pathology: None.

Inhalation, Rat(Female): Static generation of substantially saturated vapor.

Exposure Time: 4hrs @ 20 °C

Kill Rate: 0/5

Major Signs: Blepharospasm

Gross Pathology: None.

Inhalation, Rat(Male): Dynamic generation of vapor

Exposure Time: 4h 16.3 ppm @ room temperature

Kill Rate: 0/5

Major Signs: blepharospasm, periocular wetness, audible respiration

Gross Pathology: None.

Inhalation, Rat(Male): Static generation of substantially saturated vapor

Exposure Time: 4h @ 20 °C

Kill Rate: 0/5

Major Signs: blepharospasm

Gross Pathology: None

(Inhalation): Aerosol

Exposure Time: 4h

LC50: 0.48 (0.41-0.59) ml/l

Major Signs: heavy or irregular breathing, nasal discharge, gasping, nasal encrustation

Gross Pathology: lungs discolored.

IRRITATION:

(Skin, Rabbit): 4 hr covered 2/6 with necrosis

(Skin, Rabbit): 1 hr occluded minor to severe erythema and edema with necrosis, scabbing, desquamation, and alopecia

(Skin, Rabbit): 3 min occluded minor erythema

(Eye, Rabbit): 0.005 ml severe corneal injury, iritis, swelling and necrosis of eyelid

(Eye, Rabbit): 0.5ml 5% solution in water severe corneal injury, iritis, swelling and necrosis of eyelid.

(Eye, Rabbit): 0.5ml 1% solution in water traces corneal injury

SENSITIZATION:

Guinea Pig Maximization Test: intradermal injection of a 0.1% glutaraldehyde solution and topical administration of a 5% solution. Evidence of delayed contact hypersensitivity in 68% of test animals upon challenge.

CHRONIC TOXICITY AND CARCINOGENICITY:

Subchronic drinking water studies in rats, mice and dogs using Glutaraldehyde concentrations up to 1000 ppm showed no evidence for any target organ toxicity. In vitro studies for genotoxicity using a variety of assays have given results varying from no activity, through equivocal, to weakly positive; however, in all vivo studies for genotoxicity have been uniformly negative. Several developmental toxicity studies have demonstrated that a maternally nontoxic doses, glutaraldehyde does not produce fetotoxic, embryotoxic or teratogenic effects. In chronic (2-year) continuous drinking water combined chronic toxicity-oncogenicity study using Fischer 344 rats, there was no evidence for non-oncogenic target organ toxicity. The only possible oncogenicity-related finding was an increase in the incidence of large granular cell lymphocytic leukemia in female, but not male, rats. The pattern of the response suggests that it does not represent direct chemical carcinogenic activity but, rather, a modifying influence on the expression of this spontaneous and commonly occurring neoplasm in the Fischer 344 rat.

Human experience: Studies in humans have shown that glutaraldehyde is neither phototoxic nor a photosensitizer. Subchronic drinking water studies in rats, mice and dogs using concentrations up to 1000 ppm showed no evidence for any target organ toxicity. In vitro studies for genotoxicity using a variety of assays have given results varying from no activity through equivocal, to weakly positive; however, all in vivo studies for genotoxicity have been uniformly negative. Several developmental toxicity studies have demonstrated that at maternally nontoxic doses, glutaraldehyde does not produce fetotoxic, embryotoxic or teratogenic effects. In a two-generation reproduction study involving continuous exposure of CD rats to glutaraldehyde up to 1000 ppm, in drinking water there were effects on parental body weight and food consumption at 1000 ppm (due to an aversion to the taste), but no adverse effects on reproductive performance. In a chronic 2-year) continuous drinking water combined chronic toxicity-oncogenicity study using Fischer 344 rats; there was no evidence for nononcogenic target organ toxicity. The only possible oncogenicity-related finding was an increase in the incidence of large granular cell lymphocytic leukemia in female, but not male, rats. The pattern of the response suggests that it does not represent direct chemical carcinogenic activity but, rather, a modifying influence on the expression of this spontaneous and commonly occurring neoplasm in the Fischer 344 rat. Repeated applications of aqueous solutions of glutaraldehyde to the rat skin for 20 doses over a 28-day period at 50,100, or 150 mg/kg/day produced mild local inflammatory effects, but no evidence for target organ or tissue systemic toxicity. An extensive clinical survey has been conducted on nursing staff in 59 endoscopy units (340 currently employed workers and 18 former employees); investigational procedures included detailed questionnaire, sensitization to common allergens, and blood for IgE measurements, lung function tests, peak flow diaries, and measurement of workplace glutaraldehyde vapor concentrations. About two-thirds of current employees had ocular, nasal, or lower respiratory tract symptoms, but these were more prevalent for non-work conditions. The only effect correlated with glutaraldehyde exposure was nasal irritation. There was a slight, but no statistically or biologically significant, decrease in FEVI for those with lower respiratory tract symptoms. There were no indications of asthma and no objective evidence for respiratory sensitization.

This product **does not** contain any compounds listed by NTP or IARC or regulated by OSHA as a carcinogen.

Section 12: Ecological Information

Ecological Information:

BOD (% Oxygen Consumption)

Day 5 Day 10 Day 15 Day 20 Day 30

32% 68% 86%

Ecotoxicity to Micro Organisms: Bacterial/NA LC50 16 h 50 mg/l

Ecotoxicity to Aquatic Invertebrates: Daphnia LC50 48 h 11.5 mg/l

Confidence Limits: 9.4 - 14.2 mg/l

Ecotoxicity to Fish: Blue gill LC50 96 h 22 mg/l

Further Information: ThOD (measured) 1.00

Chemical Fate Information: ND

Section 13 Disposal Considerations

RCRA 40 CFR 261 Classification: Not listed. Atomize into a very hot incinerator fire or mix with a suitable flammable solvent, and incinerate where permitted under appropriate Federal, State and local regulations. High water content may dampen flame. Empty containers should be recycled or disposed of through an approved waste management facility.

Federal, State and local laws governing disposal of materials can differ. Ensure proper disposal compliance with proper authorities before disposal.

Section 14: Transportation Information

US DOT Information: Proper shipping name: Non-hazardous from stand point of shipping.

IATA: Proper shipping name: Non-hazardous from stand point of shipping.

IMO: Proper shipping name: ND

Marine Pollutant: No

Canadian TDG: Non-hazardous from stand point of shipping.

Section 15: Regulatory Information

United States Federal Regulations

MSDS complies with OSHA's Hazard Communication Rule 29, CFR 1910.1200.

SARA: Section 302, 304:

The following components of this product are listed as extremely hazardous substances in 40 CFR Part 355 and are present at levels which could require reporting and emergency planning: None

Section 313: The following components of this product are listed as toxic chemicals in 40 CFR 372.65 and are present at levels which could require reporting and customer notification under Section 1 313 and 40 CFR Part 372. This product does not contain toxic chemicals at levels which could require reporting under this statute.

SARA Title III: Sections 311 and 312: Delayed Hazard: Yes. Fire Hazard: No. Immediate Health Hazard: Yes. Reactive Hazard: No. Sudden Release of Pressure Hazard: No.

RCRA: Not listed

TSCA: All components of this product are on the TSCA inventory or are exempt from TSCA inventory requirements.

CERCLA: None

State Regulations

California Proposition 65: This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

Pennsylvania (Worker and Community Right-to-Know Act): This product is subject to the Worker and Community Right-to-Know Act. The following components of this product are at levels which could require identification in the MSDS: Glutaraldehyde (111-30-8) $\leq 8.0000\%$

Massachusetts (Hazard Substances Disclosure by Employers): The following components of this product appear on the Massachusetts Substance List and are present at levels which could require identification in the MSDS: Glutaraldehyde (111-30-8) $\leq 8.0000\%$

California SCAQMD Rule 443.1, VOC: Not applicable.

International Regulations

Canada WHMIS: This product contains material listed on the CPR Inventory list.
Europe EINECS Numbers: Glutaraldehyde (111-30-8): EINECS#: 203-856-5. Water (7732-18-5):
EINECS#: 231-791-2. Methanol (67-56-1): EINECS#: 200-659-6.

Section 16: Other Information

Label Information: ND

European Risk and Safety Phrases: ND

European symbols needed: ND

Canadian WHMIS Symbols: ND

HMIS® Rating: Health: **3**; Fire: **0**; Reactivity: **1**

NFPA Rating: Health: **2**; Fire: **0**; Reactivity: **1**

(0=least, 1=Slight, 2=Moderate, 3=High, 4=Extreme)

Abbreviations used in this document

NE= Not established

NA= Not applicable

NIF= No Information Found

ND= No Data

Disclaimer

Ted Pella, Inc. makes no warranty of any kind regarding the information furnished herein. Users should independently determine the suitability and completeness of information from all sources. While this data is presented in good faith and believed to be accurate, it should be considered only as a supplement to other information gathered by the user. It is the User's responsibility to assure the proper use and disposal of these materials as well as the safety and health of all personnel who may work with or otherwise come in contact with these materials.

MSDS Form 0013F1 V2

HYDROGEN PEROXIDE SOLUTION 3%

1. Product Identification

Synonyms: Hydrogen Dioxide Solution, 3%; Hydrogen Peroxide Topical Solution U.S.P

CAS No.: 7722-84-1

Molecular Weight: 34.01

Chemical Formula: H₂O₂ in aqueous solution (3%)

Product Codes: 2180, 2182

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Hydrogen Peroxide	7722-84-1	2 - 4%	Yes
Phenacetin	62-44-2	< 0.05%	No
Water	7732-18-5	96 - 98%	No

3. Hazards Identification

Emergency Overview

WARNING! MAY BE HARMFUL IF SWALLOWED. CAUSES EYE IRRITATION.

SAF-T-DATA^(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate

Flammability Rating: 0 - None

Reactivity Rating: 1 - Slight

Contact Rating: 2 - Moderate

Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:

Not expected to be a health hazard under normal conditions.

Ingestion:

Large oral doses may cause irritation and blistering to the mouth, throat, and abdomen. May also cause abdominal pain, vomiting, and diarrhea.

Skin Contact:

No adverse effects expected on intact skin. Contact on burn or open skin may cause stinging pain or irritation.

Eye Contact:

Causes irritation, redness, and pain.

Chronic Exposure:

No information found.

Aggravation of Pre-existing Conditions:

No information found.

4. First Aid Measures

Inhalation:

Not expected to require first aid measures.

Ingestion:

Give several glasses of water to drink to dilute. If large amounts were swallowed, get medical advice.

Skin Contact:

Not expected to require first aid measures. Wash exposed area with soap and water. Get medical advice if irritation develops.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:

Not considered to be a fire hazard. Concentrated hydrogen peroxide (30%) is a strong oxidizer, but this dilute product does not present that hazard.

Explosion:

Not considered to be an explosion hazard. Drying of concentrated hydrogen peroxide on clothing or other combustible materials may cause fire or explosion.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Small amounts of residue may be flushed to sewer with plenty of water.

7. Handling and Storage

Store in a cool, well-ventilated dark area. Protect from freezing. Isolate from incompatible substances. Protect container from physical damage. Containers of this material may be

hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL):

1 ppm (TWA).

-ACGIH Threshold Limit Value (TLV):

1 ppm (TWA), A3: Animal carcinogen.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):

Not expected to require personal respirator usage. If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airtight hood, or full-facepiece self-contained breathing apparatus. This substance has unknown warning properties.

Skin Protection:

Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

Clear, colorless solution.

Odor:

Odorless.

Solubility:

Infinitely soluble.

Specific Gravity:

ca. 1.0

pH:

No information found.

% Volatiles by volume @ 21C (70F):

100

Boiling Point:

ca. 100C (ca. 212F)

Melting Point:

ca. 0C (ca. 32F)

Vapor Density (Air=1):

No information found.

Vapor Pressure (mm Hg):

No information found.

Evaporation Rate (BuAc=1):

No information found.

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

Decomposes to water and oxygen.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

Heat, reducing agents, organic materials, dirt, alkalis, rust, and many metals.

Conditions to Avoid:

Light, heat, incompatibles.

11. Toxicological Information

-----\Cancer Lists\-----

---NTP Carcinogen---

Ingredient	Known	Anticipated	IARC Category
Hydrogen Peroxide (7722-84-1)		No	No 3
Phenacetin (62-44-2)	No	Yes	2A
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:

No information found.

Environmental Toxicity:

No information found.

13. Disposal Considerations

Dilute with water and flush to sewer if local ordinances allow, otherwise, whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----

Ingredient	TSCA	EC	Japan	Australia
Hydrogen Peroxide (7722-84-1)	Yes	Yes	Yes	Yes

Phenacetin (62-44-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----

--Canada--
Korea DSL NDSL Phil.

Hydrogen Peroxide (7722-84-1)	Yes	Yes	No	Yes
Phenacetin (62-44-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----

-SARA 302- -----SARA 313-----
RQ TPQ List Chemical Catg.

Hydrogen Peroxide (7722-84-1)	No	No	No	No
Phenacetin (62-44-2)	No	No	No	No
Water (7732-18-5)	No	No	No	No

-----\Federal, State & International Regulations - Part 2\-----

-RCRA- -TSCA-
CERCLA 261.33 8(d)

Hydrogen Peroxide (7722-84-1)	No	No	No
Phenacetin (62-44-2)	100	U187	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: Yes (Mixture / Liquid)

WARNING:

THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: None allocated.

Poison Schedule: S5

WHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 1 Flammability: 0 Reactivity: 1

Label Hazard Warning:

WARNING! MAY BE HARMFUL IF SWALLOWED. CAUSES EYE IRRITATION.

Label Precautions:

Avoid contact with eyes.

Keep container closed.

Wash thoroughly after handling.

Label First Aid:

In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention. If swallowed, give large amounts of water to drink. Never give anything by mouth to an unconscious person. If large amounts were swallowed, get medical advice.

Product Use:

Laboratory Reagent.

Revision Information:

No Changes.

Disclaimer:

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