



Material Safety Data Sheet

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Phone Calls: 301-816-8129
8 a.m. to 5 p.m. EST Mon. - Fri.

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RESIDUAL SOLVENT CLASS 1 - BENZENE

Catalog Number: 1601146

Revision Date:

August 20, 2008

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

Common Name: Benzene

Manufacturer: U. S. Pharmacopeia

Responsible Party: Reference Standards Technical Services

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Product Use: USP Reference Standards and Authentic Substances are used for chemical tests and assays in analytical, clinical, pharmaceutical, and research laboratories.

SECTION 2 - HAZARD INFORMATION

EMERGENCY OVERVIEW: Cancer Suspect Agent. Toxic. Irritant. Combustible.

This reference standard contains benzene in dimethyl sulfoxide (DMSO). The mixture has not been tested to determine specific physical hazards, but it is considered potentially combustible.

DMSO is an irritant and is rapidly absorbed through the skin. It may carry dissolved chemicals into the body through this route.

Benzene is toxic, irritant, and a known human carcinogen.

Adverse Effects: Adverse effects of DMSO may include redness, itching, or rash on skin; garlic-like taste or odor on breath and skin; swelling of face; troubled breathing; shortness of breath; nasal congestion; gastrointestinal disturbances; drowsiness; and headache. Adverse effects of benzene may include an initial feeling of euphoria followed by drowsiness, dizziness, blurred vision, fast heart rate, headache, tremor, confusion, vomiting, trouble breathing, weakness, burning sensation, delirium, collapse, loss of consciousness, convulsions, and death. Possible allergic reaction to material if inhaled, ingested or in contact with skin.

Overdose Effects: Continued or high exposure to benzene may cause the effects listed above as well as seizures, paralysis, abnormal heart rhythm, coma, and death.

Acute: Acute effects of benzene include eye, skin, gastrointestinal and/or respiratory tract irritation; central nervous system excitation followed by depression.

Chronic: Chronic effects of benzene include possible hypersensitization, central nervous system effects (headache, dizziness, irritability, nervousness, fatigue, loss of appetite), and bone marrow depression, leading to blood disorders including aplastic anemia and leukemia.

Medical Conditions Aggravated by Exposure: Hypersensitivity to material, glucose-6-phosphate dihydrogenase deficiency, pancytopenia, and liver or blood disorders.

Cross Sensitivity: n/f**Target Organs:** Central nervous system, bone marrow, blood. (Benzene)**For additional information on toxicity, see Section 11.****SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS****Common Name:** Benzene**Formula:** See Composition**Synonym:** n/f**Chemical Name:** Benzene in dimethyl sulfoxide**CAS:** See Composition**RTECS Number:** See Composition**Chemical Family:** Aromatic Hydrocarbon (Benzene)**Therapeutic Category:** Residual solvent**Composition:** Benzene (C₆H₆; CAS # 71-43-2; RTECS # CY1400000): 1%
Dimethyl sulfoxide (C₂H₆OS; CAS # 67-68-5; RTECS # PV6210000): 99%**SECTION 4 - FIRST AID MEASURES****Inhalation:** Benzene causes irritation and toxicity. Avoid inhalation. Remove to fresh air. Benzene is readily absorbed by the lungs.**Eye:** Causes irritation. Avoid contact. Flush with copious quantities of water for at least 15 minutes.**Skin:** Causes irritation. Avoid contact. Flush with copious quantities of soap and water. DMSO readily penetrates the skin and can enhance absorption of other chemicals.**Ingestion:** Benzene causes irritation and toxic effects. Avoid ingestion. Flush out mouth with water. Benzene is absorbed by the gastrointestinal tract.**General First Aid Procedures:** Remove from exposure. Remove contaminated clothing. Persons developing serious hypersensitivity (anaphylactic) reactions must receive immediate medical attention. If person is not breathing give artificial respiration. If breathing is difficult give oxygen. Obtain medical attention.**Note to Physicians****Overdose Treatment:** Treatment of benzene overdose should be symptomatic and supportive and may include the following:

1. Do NOT induce vomiting.
2. Administer activated charcoal as a slurry.
3. Perform gastric lavage soon after ingestion (within one hour). Protect airway by placement in Trendelenburg and left lateral decubitus position or by endotracheal intubation. Control any seizures first.
4. For seizures, administer intravenous diazepam or lorazepam. If seizures recur, consider phenobarbital. Monitor for hypotension, dysrhythmias, respiratory depression, and need for endotracheal intubation. Evaluate for hypoglycemia, electrolyte disturbances, and hypoxia.
5. Monitor EKG for cardiac arrhythmias. AVOID epinephrine due to possible myocardial infarction. [Meditext 2008]

SECTION 5 - FIREFIGHTING MEASURES**Extinguisher Media:** Alcohol foam or other appropriate media.**Fire and Explosion Hazards:** DMSO is combustible and reacts violently with many acyl, aryl and non-metal halides, boron compounds and metal salts of oxoacids. Vapors may form explosive mixtures with air. Vapors may travel to sources of ignition and flash back. This mixture has not been tested.**Firefighting Procedures:** As with all fires, evacuate personnel to a safe area. Firefighters should use self-contained breathing equipment and protective clothing.**SECTION 6 - ACCIDENTAL RELEASE MEASURES**

Spill Response: Wear approved respiratory protection, chemically compatible gloves and protective clothing. Remove ignition sources. Ventilate enclosed spaces. Absorb with suitable material. Do not flush into a confined space such as a sewer. Avoid breathing vapors. Place spillage and all contaminated cleanup materials in a thick plastic hazardous waste disposal bag or leakproof container and label it CAUTION: HAZARDOUS CHEMICAL WASTE. Wash spill site.

SECTION 7 - HANDLING AND STORAGE

Handling: As a general rule, when handling USP Reference Standards avoid all contact and inhalation of dust, mists, and/or vapors associated with the material. Wash thoroughly after handling.

Storage: Store in tight, light-resistant container as defined in the USP-NF. This material should be handled and stored per label instructions to ensure product integrity. Store in a refrigerator.

SECTION 8 - EXPOSURE CONTROL / PERSONAL PROTECTION

Engineering Controls: Engineering controls such as exhaust ventilation are recommended.

Respiratory Protection: Use a NIOSH-approved respirator, if it is determined to be necessary by an industrial hygiene survey involving air monitoring.

Gloves: Chemically compatible

Eye Protection: Safety glasses or goggles

Protective Clothing: Protect exposed skin.

Exposure Limits: Benzene:
OSHA: TWA 1 ppm; STEL 5 ppm
NIOSH: TWA 0.1 ppm; STEL 1 ppm; IDLH 500 ppm
ACGIH: TWA 0.5 ppm; STEL 2.5 ppm

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Properties as indicated on the MSDS are general and not necessarily specific to the USP Reference Standard Lot provided.

Appearance and Odor: Clear liquid

Odor Threshold: n/f

pH: n/f

Melting Range: n/f

Boiling Point: n/f

Flash Point: n/f

Autoignition Temperature: n/f

Evaporation Rate: n/f

Upper Flammability Limit: n/f

Lower Flammability Limit: n/f

Vapor Pressure: n/f

Vapor Density: n/f

Specific Gravity: n/f

Solubility in Water: n/f

Fat Solubility: n/f

Other Solubility: n/f

Partition Coefficient: n-octanol/water: n/f

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Percent Volatile: n/f**Reactivity in Water:** n/f**Explosive Properties:** n/f**Oxidizing Properties:** n/f**Formula:** See Composition**Molecular Weight:** n/f

SECTION 10 - STABILITY AND REACTIVITY
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Conditions to Avoid: Avoid exposure to light and heat.

Incompatibilities: n/f

Decomposition Products: When heated to decomposition material emits toxic fumes. Emits toxic fumes under fire conditions.

Stable? Yes **Hazardous Polymerization?** No

SECTION 11 - TOXICOLOGICAL PROPERTIES
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Oral Rat: Benzene:
LD50: 930 mg/kg

DMSO:
LD50: 14500 mg/kg

Oral Mouse: Benzene:
LD50: 4700 mg/kg

DMSO:
LD50: 7920 mg/kg

Other Toxicity Data: Benzene:
Inhalation Mouse LC50: 9980 ppm
Inhalation Rat LC50: 10000 ppm/7hr
Skin Rabbit LD50: >9400 microliter/kg
Skin Mouse LD50: 48 mg/kg
Skin Guinea Pig LD50: >9400 microliter/kg

DMSO:
Inhalation Rat LC50: >25 mg/L/40 hour
Skin Mouse LD50: 50 grams/kg
Skin Rat LD50: 40 grams/kg

Irritancy Data: Benzene:
Rabbit/skin (Standard Draize, 20 mg/24hr): moderate
Rabbit/skin (Open Draize, 60 microliter/8hr): mild
Rabbit/skin (Open Draize, 15 mg/24hr): mild
Rabbit/eye (Standard Draize, 2 mg/24 hr): severe
Rabbit/eye (Standard Draize, 88 mg): moderate

DMSO:
Rabbit/skin (Standard Draize, 500 mg/24 hour): mild
Rabbit/skin (Open Draize, 10 mg/24 hour): mild
Rabbit/eye (Standard Draize, 500 mg/24 hour): mild

Corrosivity: n/f

Sensitization Data: DMSO:
Guinea Pig Buehler Test: not sensitizing

Listed as a Carcinogen by: **NTP:** Yes **IARC:** Yes **OSHA:** Yes

Other Carcinogenicity Data: Benzene:
In a systematic review of the literature through October 2004 that examined cohort studies, case-controlled studies, and population-based and nested case-controlled studies, there was a high and significant risk of acute myeloid leukemia with exposure to benzene with a positive dose response relationship across all study designs, especially in highly exposed workers in rubber, shoe, and paint industries. [Meditext 2008]
Benzene induced neoplasms at multiple sites in rats and mice when administered orally, caused tumors at

multiple sites in rats when administered by inhalation, caused a tendency towards lymphoid tumor induction in mice when administered by inhalation, and increased the incidence of lung adenomas in male mice when administered by intraperitoneal injection.

Mutagenicity Data: Benzene:
Benzene tested positive in a battery of in vivo and in vitro mutagenicity tests. Micronuclei and DNA damage have been found in human lymphocytes and in mice. Chromosome abnormalities have been found in people exposed to benzene.

DMSO:
Dimethyl sulfoxide did not show a potential to induce gene mutations in bacterial or yeast cells, and was not mutagenic in in vivo studies in *Drosophila*. Dimethyl sulfoxide did not induce micronuclei or sister-chromatid exchange in mice or chromosomal aberrations or sister chromatid exchange in mammalian cells, but did induce an increase in chromosomal aberrations in rats. [EPA 2007]

Reproductive and Developmental Effects: Benzene:
Benzene caused embryolethality in mice given 0.3 ml/kg by gavage, abnormalities in cleaving embryos in female rats exposed to 300 - 1000 mg/m³ vapor, and fetotoxicity in mice exposed to 1600 micrograms/m³ by inhalation and rabbits exposed by inhalation. In male mice exposed to doses above 2.5 ml/kg, benzene caused an increase in cytotoxic effects on germ cell histogenesis. Benzene did not increase the incidence of birth defects in pregnant mice administered 0.3 ml/kg by gavage, pregnant rats exposed to 2200 ppm of vapor, or pregnant rabbits and mice exposed to 500 ppm.

DMSO:
Examination of the reproductive system during a 13-week inhalation repeated-dose toxicity study in rats revealed no abnormalities on estrus cycle in females, sperm count, motility or morphology in males, or on the reproductive organs of both sexes. In two oral developmental toxicity studies in rats, maternal effects included decreased food consumption and decreased body weight gain. Developmental effects included decreased fetal weights, higher rates of early resorptions per animal, increased total post-implantation loss, dilated renal pelvis, dilated ureters and reduced or delayed ossification of ribs. All of the fetal effects except dilated renal pelvis occurred at levels that demonstrated maternal toxicity. [EPA 2007]

SECTION 12 - ECOLOGICAL INFORMATION

Ecological Information: n/f

SECTION 13 - DISPOSAL CONSIDERATIONS

Disposal: Place material in a thick plastic hazardous waste disposal bag or leakproof container and label it CAUTION: HAZARDOUS CHEMICAL WASTE. Dispose of waste in accordance with all applicable Federal, State and local laws.

SECTION 14 - TRANSPORT INFORMATION

Shipping Name: n/f

Class: n/f

UN Number: n/f

Packing Group: n/f

Additional Transport Information: n/f

SECTION 15 - REGULATORY INFORMATION

U.S. Regulatory Information: Benzene:

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EPCRA Sec. 304 RQ: 10 lb (4.54 kg)

California Proposition 65: Carcinogen, Developmental Toxicity, Male Reproductive Toxicity

International Regulatory Information: Benzene:

EINECS # 200-753-7

Hazard Code: F, T

Risk Phrases: R45, R46, R11, R36/38, R48/23/24/25, R65

Safety Phrases: S53, S45

Canada: WHMIS Classification B2, D2A, D2B

DMSO:

EINECS # 200-664-3

SECTION 16 - OTHER INFORMATION

Revision: 20-Aug-08**Previous Revision Date:** 05-Sep-03