



Material Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION	
<i>Product Information</i>	
Product name	BiCNU® (carmustine for injection)
Version	3.0, 10/05/2011
Jurisdiction	This Material Safety Data Sheet was prepared for the jurisdiction USA.
Chemical Name	Urea, N,N'-bis(2-chloroethyl)-N'-nitroso-
Synonyms	Carmustine
Intended Uses	This material is a finished drug product for patient use. It is used in the treatment of cancer.
<i>Company/Undertaking Identification</i>	
Address	Bristol-Myers Squibb Company P.O. Box 191 New Brunswick, New Jersey 08903 United States of America 1-732-227-7380
Emergency Phone Number	CHEMTREC 1-800-424-9300. For all international transportation emergencies call CHEMTREC at 1-703-527-3887. Collect calls accepted.

2. COMPOSITION/INFORMATION ON INGREDIENTS		
Components	Concentration	CAS-No.
<i>Hazardous components</i>		
Carmustine	100 %	154-93-8

3. HAZARDS IDENTIFICATION	
<i>Emergency Overview</i>	
Appearance	solid : light yellow ; (lyophilized), flakes
Signal Word	Danger
Hazard Statements	Fatal if swallowed. May cause genetic defects. May cause cancer. May damage fertility. May damage the unborn child. Causes damage to organs through prolonged or repeated exposure. CAUTION-SUBSTANCE NOT FULLY TESTED Target Organs: bone marrow, lungs, liver, gastrointestinal tract, kidney, male reproductive organs.
Precautionary Measures	Do not breathe dust/fume/gas/mist/vapours/spray. Use personal protective equipment as required. Avoid contact during pregnancy/while nursing. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wash thoroughly after handling. Do not eat, drink or smoke when using this product.

<i>Potential Health Effects</i>	
Eyes	Not available
Skin	Causes mild and/or transient skin irritation.
Ingestion	Fatal if swallowed. Causes damage to organs through prolonged or repeated exposure.
Inhalation	Not available
Target Organs	bone marrow, lungs, liver, gastrointestinal tract, kidney, male reproductive organs
Signs and Symptoms	Refer to Section 11.
Medical Conditions Aggravated Include:	bone marrow suppression, and, respiratory disorders
<i>Environmental Effects</i>	Not available

4. FIRST AID MEASURES

Eye contact	Rinse immediately with plenty of water for at least 15 minutes. Keep eye wide open while rinsing. Obtain medical attention.
Skin contact	Take off contaminated clothing and shoes immediately. Wash off immediately with plenty of water for at least 15 minutes. Discard contaminated clothing or wash before re-use. If exposed or concerned: Get medical attention/advice.
Inhalation	Move to fresh air. Oxygen or artificial respiration if needed. If exposed or concerned: Get medical attention/advice.
Ingestion	IF SWALLOWED: Immediately call a POISON CENTRE or doctor/physician. Rinse mouth.
Notes to Physician	This product has been reported to interact with the following medications: cytotoxic and cytostatic medicines, Cimetidine, and, certain vaccines. Refer to Section 11. May cause harm to unborn child.
Medical Surveillance	A pre-placement physical examination and history for employees with potential exposure to this compound is recommended. Baseline testing would include: a complete blood count with differential, lung function test, a blood test for liver function, and, a blood test for kidney function. Based on opportunity for exposure and duration of exposure a periodic follow-up examination may be considered. This exam should be overseen by a physician thoroughly knowledgeable about both the toxicity of this compound and the extent of work place exposure. It is recommended that the content be similar to the pre-placement exam. Employees who are pregnant, are breast-feeding, or who are concerned with other reproductive issues should be encouraged to consult with the occupational health physician monitoring worker's health.

5. FIRE-FIGHTING MEASURES

Flammable Properties	Not available
Extinguishing Media	Suitable extinguishing media: Dry chemical, Water spray, Foam Unsuitable extinguishing media: Do NOT use water jet.

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5. FIRE-FIGHTING MEASURES

Protection of Firefighters	<p>Specific hazards: Refer to HAZARDS IDENTIFICATION section for a description of hazards for this material.</p> <p>Protective equipment: Use personal protective equipment. In the event of fire, wear self-contained breathing apparatus.</p> <p>Hazardous Combustion Products: carbon oxides (COx), nitrogen oxides (NOx), and, gaseous hydrogen chloride (HCl).</p> <p>Further Information: HCl gas can form flammable or explosive mixtures with alcohols or metals. In the event of fire and/or explosion do not breathe fumes.</p>
Other information:	Decontaminate protective clothing and equipment before reuse.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions	Refer to protective measures listed in sections 7 and 8. Use personal protective equipment. Examples include tightly fitting safety goggles, disposable lab coat of low permeability with cuffs, double gloves and shoe covers. Wear respiratory protection. Depending on the nature of the spill (quantity and extent of spill) additional protective clothing and equipment such as a self-contained breathing apparatus may be needed.
Environmental precautions	Prevent release to drains and waterways. Prevent release to the environment.
Containment Methods	Wet down any dust to prevent generation of aerosols, if appropriate. Cover with suitable material.
Cleanup Methods	Spill prevention procedures and a spill response procedure should be implemented. Contain and collect spillage and place in container for disposal according to local regulations (see Section 13). Clean spill area with a deactivating solution (if available) followed by detergent and water after spill pick-up. Handle waste materials, including gloves, protective clothing, contaminated spill cleanup material, etc., as appropriate for chemically and pharmacologically similar materials.

7. HANDLING AND STORAGE

Handling Precautions	Highly potent material. Avoid exposure - obtain special instructions before use. Avoid formation of dust and aerosols. Keep away from heat and sources of ignition. Prevent release to drains and waterways.
Storage Conditions	Keep refrigerated. (2 - 8 °C) Protect against light. Keep away from heat, sparks and flames. Do not store near incompatible substances.
Container Requirements	Store in the original primary packaging as provided.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limit(s)	Company Guideline	ACGIH	OSHA	NIOSH
Carmustine	--	--	--	--
Exposure Control Band	<u>Carmustine</u> 5sc -- The established company exposure guideline falls within Exposure Control Band 5, Special Case (range < 0.1 µg/m3).			
Bristol-Myers Squibb Exposure Guidelines Summary	<u>Carmustine</u> Adherence to this guideline should protect employees from experiencing the therapeutic and/or adverse effects of this drug. Materials require particular care and handling.			

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8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Recommended Industrial Hygiene Monitoring Methods	Contact the Bristol-Myers Squibb AIHA accredited Industrial Hygiene Laboratory at 732-227-6338.
Engineering Controls and Ventilation	Use process enclosures, containment technology, or other engineering controls to keep airborne levels below recommended exposure limit. When handling quantities from 0-5 grams work in a designated laboratory or containment facility using a fume hood, biological safety cabinet (Class II, Type B1, or B2) ; glove box; and, approved vented enclosure. HEPA filtered exhaust with Bag-In/Bag-Out capacity preferred for hoods, BSCs and glove boxes. Quantities exceeding 5 grams should be handled in a containment facility using appropriate containment isolation technology with isolator/glove box systems, glove bags, double/split butterfly valves, remote operations, direct process connections and systems, or automated systems. For manufacturing and pilot plant operations, the containment level should be to keep exposures as low as reasonable achievable. Barrier/containment technology with isolator/glove bags, remote operations, direct process connections and systems, or automated systems should be used. Isolated work areas are required with rooms to provide thorough secondary containment.
Respiratory protection	Use and selection of respiratory protection is based upon engineering controls in use and potential for aerosol generation. When engineering controls are not sufficient to control exposure, wear an approved respirator with NIOSH Class 100 or high efficiency particulate (HEPA) filters or cartridges when exposures are up to 10 times the exposure control guideline. Wear a loose-fitting (Tyvek or helmet type) HEPA powered-air purifying respirator (PAPR) when exposures are 10-25 times the exposure control guideline. Wear a full facepiece negative pressure respirator with Class 100 or HEPA filters when exposures are 25-50 times the exposure control guideline. Wear a tight-fitting, full facepiece HEPA PAPR when exposures are 50-100 times the exposure control guideline. Wear a hood-shroud HEPA PAPR or full facepiece supplied air respirator operated in a pressure demand or other positive pressure mode when exposures are 100-1000 times the exposure control guideline.
Eye protection	Safety glasses with side-shields are recommended. Face shields or chemical safety goggles may be required if splash potential exists or if corrosive materials are present. Note: Choice of eye protection may be influenced by the type of respirator which is selected.
Hand protection	Wear double gloves. Wear gloves at all times when handling containers, including when unpacking, inspecting or transporting within a facility. Disposable chemotherapy gloves made from nitrile, neoprene, polyurethane and natural latex have been shown to have low permeability to many chemotherapy agents. Persons who are allergic to natural rubber latex should select gloves made from one of the other materials. Check gloves frequently to ensure that there are no small cuts or holes. Change gloves frequently, and remove immediately after overt contamination. Use care when removing and disposing of gloves in order to minimize exposure. If material is handled in solution, the solvent should also be considered when selecting protective clothing material.
Skin and body protection	For quantities up to 5 grams: wear disposable labcoat or coverall of low permeability; disposable wrist gauntlets/sleeves unless working in glove box. For quantities > 5 grams: wear full disposable coverall of low permeability; shoe covers; disposable wrist gauntlets/sleeves unless working in glove box. For manufacturing operations, gloves and booties should be taped to protective clothing to prevent gaps in PPE and air supplied full-body suits may be required as associated with advanced respiratory protection.
Hygiene	Wash hands and face before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

<i>Appearance</i>	
Physical State	solid

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9. PHYSICAL AND CHEMICAL PROPERTIES

Color	light yellow
Form	(lyophilized), flakes
<i>Other information</i>	
Molecular Weight	214.06 g/mol
Molecular formula	C5 H9 Cl2 N3 O2
Bulk density	Not available
Chemical Name	Urea, N,N'-bis(2-chloroethyl)-N'-nitroso-
Evaporation rate	Not available
Hydrolysis/Photolysis	Not available
Hygroscopicity	Not available
Log Octanol/Water Partition Coeff [log Kow]	Not available
Surface Tension	Not available
Odor	Not available
Odor Threshold	Not available
pH	Not available
pKa	Not available
Particle Size	Not available
Solubility, Water	very slightly soluble
Solubility in other solvents	alcohol: freely soluble Fat solubility: freely soluble Dichloromethane: very soluble Ether: very soluble
Specific Gravity/ Relative density	Not available
Viscosity	Not available
<i>Thermal/Stability properties</i>	
Autoignition temperature	Not available
Boiling Point	Not available
Thermal decomposition	Not available
Explosive Limits, LEL	Not available
Explosive limits, UEL	Not available
Explosiveness	There are chemical group(s) associated with explosive properties present in the molecule, and the calculated oxygen balance is greater than -200.
Flammability	Not available
Flash point	Not available
Melting Point	31 °C (with decomposition)
Oxidizing Potential	Not available
<i>Vapor Properties</i>	
Vapor Density	Not available
Vapor Pressure	Not available
Saturated Vapor Concentration	Not available

10. STABILITY AND REACTIVITY*Stability*

Chemical Stability	Stable under recommended storage conditions. It is an alkylating agent. Decomposes to an oily liquid at temperature of 35°C or warmer. Rapidly degrades in aqueous solutions at pH greater than 6.
Conditions to avoid	Not available

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10. STABILITY AND REACTIVITY

Incompatible products Polyvinylchloride

Hazardous decomposition products Hazardous decomposition products formed under fire conditions.: carbon oxides (COx), nitrogen oxides (NOx), and, gaseous hydrogen chloride (HCl).

Hazardous reactions None known.

Sensitivity to static discharge/Dust exp.

Summary Statements Although material has not been specifically tested, fine dust suspended in air in sufficient concentration and in the presence of an ignition source may pose a potential explosion hazard. Provide appropriate bonding and grounding protection to control static charge. Powder handling equipment such as dust collectors, dryers, and mills may require additional protective measures (e.g. explosion venting, inerting, etc.).

11. TOXICOLOGICAL INFORMATION

Routes of Entry Ingestion, Inhalation, Eye contact, Skin contact

Eye Irritation Carmustine
A computerized structure-toxicity analysis predicted this material to be an eye irritant.

Skin Irritation Carmustine
Mildly and/or transiently irritating to skin.

Respiratory Irritation Carmustine
A computerized structure-toxicity analysis predicted this material to be a respiratory irritant.

Sensitization Carmustine
Possible dermal sensitizer See "Human Experience".

Acute Toxicity Study **Acute Oral**
Carmustine
LD50 (Rat): 20 mg/kg
LD50 (Mouse): 19 mg/kg

Acute toxicity (other routes of administration)
Carmustine
LD50 (Rat, Intraperitoneal): 17.42 mg/kg
LD50 (Mouse, Intraperitoneal): 21.26 mg/kg
LD50 (Rat, intravenous): 13.8 mg/kg
LD50 (Mouse, intravenous): 45 mg/kg
LD50 (Rat, intramuscular): 79.6 mg/kg
LD50 (Mouse, intramuscular): 86.3 mg/kg
LD50 (Rat, Subcutaneous): 83.2 mg/kg
LD50 (Mouse, Subcutaneous): 24 mg/kg

Repeated Dose Carmustine

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11. TOXICOLOGICAL INFORMATION

Toxicity **Assessment Repeat Dose Toxicity**
Several studies were conducted. See section 11 human experience and target organs.

Genetic Toxicity Carmustine
Mutagenicity Assessment
This material was positive in a battery of in vivo and in vitro genotoxicity assays.

Carcinogenicity Carmustine
Carcinogenicity Assessment
This material was a carcinogen in animal studies. Some secondary cancers developed in persons with other cancers who were treated with this drug, either alone or in combination with other anticancer drugs. It is not known whether these were a result of the treatment with this drug, with one of the other drugs, or a result of progression of the underlying disease. This material is probably carcinogenic to humans.

Carcinogenicity	ACGIH	OSHA	NTP	IARC
Carmustine	--	Listed	Listed	2A

Reproductive Toxicity Carmustine
Assessment Reproductive Toxicity
Animal studies indicate that reproductive effects can occur. Compound may cause injury to male reproductive organs.

Developmental Toxicity Carmustine
Developmental Toxicity Assessment
Substance was harmful to the fetus at doses that did not produce adverse effects in the maternal animal. Effects include: Potential embryo-foetal toxicity and teratogenicity.

Human experience **Experiences with Human Exposure**
Carmustine
General effects therapeutic use low exposure - acute effects include: nausea, vomiting, diarrhea, anorexia, gastrointestinal disturbance, bleeding, Negative effect on the healing of wounds., infection, fever, sore throat, jaundice, loss of balance, uncontrolled muscle movements, dizziness, headache, chest pain, allergic reactions, burning, redness and swelling of skin, changes in skin pigment, bruising, blood vessel changes, changes in urine chemistry, eye effects, central nervous system toxicity, cardiac irregularities, death. low exposure - delayed effect include: bone marrow suppression, decreased white blood cell count, decreased red blood cell count, lung toxicity, lung inflammation, pulmonary fibrosis, increased liver enzymes, liver toxicity, kidney toxicity, kidney failure.

Target Organs Carmustine
bone marrow, lungs, liver, gastrointestinal tract, kidney, male reproductive organs

11. TOXICOLOGICAL INFORMATION

Symptoms	<u>Carmustine</u> See "Human Experience".
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Pharmacokinetics/T oxicokinetics	Not available
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Other Toxicity Information	Not available
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12. ECOLOGICAL INFORMATION

Ecotoxicological Information (Aquatic)	Not available
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Ecotoxicological Information (Terrestrial)	Not available
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Chemical fate information	Not available
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13. DISPOSAL CONSIDERATIONS

Advice On Disposal And Packaging	Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements. This information presented only applies to the material as supplied.
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Other information	Disposal by incineration is recommended.
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14. TRANSPORT INFORMATION

US DOT

UN/ID No.	UN3249
Proper shipping name	Medicine, solid, toxic, n.o.s. (Carmustine)
Class	6.1
Packing group	II
Labelling	6.1

IMDG

UN/ID No.	UN3249
Proper shipping name	Medicine, solid, toxic, n.o.s. (Carmustine)
Class	6.1
Packing group	II
Labelling	6.1
EmS	6.1-04

ICAO/IATA-DGR

UN/ID No.	UN3249
Proper shipping name	Medicine, solid, toxic, n.o.s. (Carmustine)
Class	6.1
Packaging group	II

ADR/RID-Labels

Labelling	6.1
UN/ID No.	UN3249
Proper shipping name	Medicine, solid, toxic, n.o.s. (Carmustine)
Class	6.1
Packaging group	II

15. REGULATORY INFORMATION**United States of America**

OSHA Hazard Classification	Highly Toxic Reproductive Toxicity Developmental Toxicity
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15. REGULATORY INFORMATION

	Mutagenicity Carcinogenicity Target Organs Caution - substance not yet fully tested.
313 Toxic Release Inventory. Listed Chemicals/Compounds	No components listed on the SARA 313 inventory.
TSCA Inventory	Not listed. Food, drug and cosmetic products are exempt from TSCA.
California Prop. 65	Carcinogen Developmental toxicant
	Carmustine Carmustine


International**Mexico**

Mexico Classification	Health classification - Serious Hazard - 3 - Substances that can cause serious or permanent harm under emergency conditions Reproductive Toxicity Developmental Toxicity Mutagenicity Carcinogenicity
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Europe

EINECS/ELINCS/Registration Number	Carmustine: 205-838-2
Classification	Medicinal products are exempt from classification and labeling requirements under EU Preparations Directive 1999/45/EC.

UN Globally Harmonized System (GHS)

Classification	Acute Toxicity - Oral - Category 2 Germ Cell Mutagenicity - Category 1B Carcinogenicity - Category 1B Toxic To Reproduction - Male Reproductive Toxicity - Category 1B Toxic To Reproduction - Developmental Toxicity - Category 1B Specific Target Organ Systemic Toxicity (Repeated Exposure) - Category 1 Caution - substance not yet fully tested.
Symbol	
Signal Word	Danger
Hazard Statements	Fatal if swallowed. May cause genetic defects. May cause cancer. May damage fertility or the unborn child (male reproductive toxicity, developmental toxicity) . Causes damage to organs (bone marrow, lungs, liver, gastrointestinal tract, kidney, male reproductive organs) through prolonged or repeated exposure.
Precautionary Statements	Refer to HAZARDS IDENTIFICATION section.

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16. OTHER INFORMATION

MSDS preparation information

Prepared by Research and Development Environment, Health and Safety 1-732-227-7380

Prepared on 10/05/2011

This Safety Data Sheet has been revised. This data sheet contains changes from the previous version in section(s): 1, 3, 4, 5, 9, 11, 14, 15, and 16.

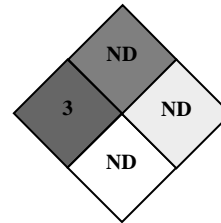
Other information

HMIS

Health	3*
Flammability	Not Determined (ND)
Reactivity	Not Determined (ND)
Personal protective equipment	See Section 8.

NFPA

Health 3
Fire ND
Reactivity ND
Special ND



The information contained in this MSDS is believed to be accurate and represents the best information reasonably available at the time of preparation. However, we make no warranty, express or implied, with respect to such information. and we assume no liability from its use.