


Material Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION	
<i>Product Information</i>	
Product name	Gleostine® (Iomustine) Capsules, 5 mg, 10 mg, 40 mg and 100 mg
Version	1.1, 11/14/2017
Jurisdiction	This Safety Data Sheet was prepared for the Globally Harmonized System (GHS).
Active substance	Lomustine
Synonyms	Lomustine 5, 10, 40 and 100 mg Capsules; Gleostine® 5, 10, 40 and 100 mg Capsules
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	NextSource Biotechnology, LLC 80 SW 8th Street, Suite #2660 Miami, FL 33130 1.844.243.4968
Emergency Phone Number	NextSource Biotechnology, 855-672-2468; 1-800-FDA-1088

2. HAZARDS IDENTIFICATION	
UN Globally Harmonized System (GHS)	
Classification	Acute Toxicity - Oral - Category 4 Germ Cell Mutagenicity - Category 1B Carcinogenicity - Category 1B Toxic To Reproduction - Reproductive Toxicity - Category 1B Toxic To Reproduction - Developmental Toxicity - Category 1B Specific Target Organ Systemic Toxicity (Repeated Exposure) - Category 1
Symbol	
Signal Word	Danger
Hazard Statements	Harmful if swallowed. May cause genetic defects. May cause cancer. May damage fertility (male reproductive toxicity, female reproductive toxicity) . May damage the unborn child (developmental toxicity) . Causes damage to organs (bone marrow, lungs, kidney, male reproductive organs, liver) through prolonged or repeated exposure.

2. HAZARDS IDENTIFICATION

Precautionary Statements	Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. Do not breathe dust.
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3. COMPOSITION/INFORMATION ON INGREDIENTS

Components	Concentration	CAS-No.
<i>Hazardous components</i>		
Lomustine	3 - 22 %	13010-47-4
Titanium Dioxide	<1 %	13463-67-7
<i>Other ingredients</i>		
Non-Hazardous Ingredients	<25 %	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. If exposed or concerned: Get medical attention/advice.
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 CENTER or doctor/physician. Rinse mouth. Do NOT induce vomiting. Never give anything by mouth to an unconscious person.
Notes to Physician	This product has been reported to interact with the following medications: certain vaccines, cytotoxic and cytostatic medicines. Refer to Section 11.
Medical Surveillance	<p>The need for a pre-placement physical examination and history for employees with potential exposure to this compound is to be evaluated by a physician that is thoroughly knowledgeable about both the toxicity of this compound and the extent of work place exposure. Baseline testing would include: a complete blood count with differential, a blood test for kidney function, a blood test for liver function, a urine analysis. Based on opportunity for exposure and duration of exposure a periodic follow-up examination may be considered. It is recommended that the content be similar to the pre-placement exam.</p> <p>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.</p>

5. FIRE-FIGHTING MEASURES

Flammable Properties	Not available
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5. FIRE-FIGHTING MEASURES	
Extinguishing Media	Suitable extinguishing media: Dry chemical, Water spray, Foam Unsuitable extinguishing media: Do NOT use water jet.
Protection of Firefighters	Specific hazards: Toxic Irritant Mutagen Developmental toxicant Protective equipment: Use personal protective equipment. In the event of fire, wear self-contained breathing apparatus. Hazardous Combustion Products: carbon oxides (COx), nitrogen oxides (NOx), gaseous hydrogen chloride (HCl). 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.
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	Store at room temperature. Protect against light. Keep away from heat, sparks and flames. Store locked up.
Container Requirements	Store in the original primary packaging as provided. Keep tightly closed.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION				
COMPONENT EXPOSURE LIMIT(S)				
Exposure limit(s)	Company Guideline	ACGIH	OSHA	NIOSH
Lomustine	--	--	--	--
Titanium Dioxide	--	10 mg/m3 TWA	--	5,000 mg/m3 IDLH

8. EXPOSURE CONTROLS / PERSONAL PROTECTION	
Magnesium Stearate	-- 10 mg/m3 8 hour-TWA -- --
Yellow Iron Oxide	-- -- -- --
Exposure Control Band	<u>Lomustine</u> 5sc -- Material is assigned to Exposure Control Band 5, Special Case (range < 0.1 µg/m3).
NextSource Biotechnology Exposure Guidelines Summary	<u>Lomustine</u> A specific exposure guideline has not yet been established. Materials require particular care and handling.
Recommended Industrial Hygiene Monitoring Methods	A specific exposure sampling method is not available. General - The health hazard risk of handling this material is dependent on many factors, including physical form, % API in material being handled, duration and frequency of process task, and effectiveness of controls. If it is necessary to handle this compound outside of engineering controls, an exposure risk assessment should be conducted and procedures documented by a qualified EHS professional.
EXPOSURE CONTROLS / PERSONAL PROTECTION FOR MATERIAL AS SUPPLIED	
<u>Gleostine® (Iomustine) Capsules, 5 mg, 10 mg, 40 mg and 100 mg</u> 5sc -- Material is assigned to Exposure Control Band 5, Special Case (range < 0.1 µg/m3).	
Engineering Controls and Ventilation	FOR MANUFACTURING PROCESSES (BULK): 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. FOR CLINICAL SETTING USE (DRUG PRODUCT): When handling small quantities in a clinical setting, good room ventilation is desirable. Specific engineering controls should not be needed.
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 control exposure, wear an approved respirator with NIOSH Class 100 or high efficiency particulate (HEPA) filters or cartridges (EN 140/EN 136) 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) (EN 12941) when exposures are 10-25 times the exposure control guideline. Wear a full facepiece negative pressure respirator with Class 100 or HEPA filters (EN 136) when exposures are 25-50 times the exposure control guideline. Wear a tight-fitting, full facepiece HEPA PAPR (EN 12942) when exposures are 50-100 times the exposure control guideline. Wear a hood-shroud HEPA PAPR (EN 12941) or full facepiece supplied air respirator (EN 139) operated in a pressure demand or other positive pressure mode when exposures are 100-1000 times the exposure control guideline.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION	
Eye protection	Safety glasses with side-shields are recommended (EN 166). Face shields or chemical safety goggles (EN 166) 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 (EN 420, EN 374). 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 MANUFACTURING PROCESSES (BULK): For quantities, up to 5 grams: wear disposable labcoat or coverall of low permeability (EN 1149-1); disposable wrist gauntlets/sleeves unless working in glove box. For quantities > 5 grams: wear full disposable coverall of low permeability (EN 1149-1); 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 (EN 1073) may be required as associated with advanced respiratory protection. FOR CLINICAL SETTING USE (DRUG PRODUCT): When handling small quantities in a clinical setting, good room ventilation is desirable. Specific engineering controls should not be needed.
Hygiene	Wash hands and face before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES	
<i>Appearance</i>	
Physical State	solid
Color	white/white white/green green/green
Form	capsule
<i>Other information</i>	
Molecular Weight	Not applicable
Molecular formula	Not applicable
Bulk density	Not available
Evaporation rate	Not available
Hydrolysis/Photolysis	Not available
Hygroscopicity	Not available
Log Octanol/Water Partition Coefficient [log Kow]	
Surface Tension	Not available
Odor	Not available
Odor Threshold	Not available
pH	Not available
pKa	Not available
Particle Size	Not available
Solubility, Water	Not available
Specific Gravity/ Relative density	Not available
Viscosity	Not available

9. PHYSICAL AND CHEMICAL PROPERTIES	
<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	
Explosiveness	Not available
Flammability	Not available
Flash point	Not available
Melting Point	Not available
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	
<i>Stability</i>	
Chemical Stability	Stable under normal conditions. It is an alkylating agent.
Conditions to avoid	excessive heat
Incompatible products	Not available
Hazardous decomposition products	Hazardous decomposition products formed under fire conditions may include: carbon oxides (COx), nitrogen oxides (NOx), gaseous hydrogen chloride (HCl).
Hazardous reactions	None known.
<i>Sensitivity to static discharge/Dust exp.</i>	
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	<u>Lomustine</u> Mildly and/or transiently irritating to eyes <u>Titanium Dioxide</u> Mildly and/or transiently irritating to eyes

11. TOXICOLOGICAL INFORMATION	
Skin Irritation	<p><u>Lomustine</u> Mildly and/or transiently irritating to skin.</p> <p><u>Titanium Dioxide</u> Mildly and/or transiently irritating to skin.</p>
Respiratory Irritation	<p><u>Lomustine</u> May cause irritation of respiratory tract.</p> <p><u>Titanium Dioxide</u> Irritating to respiratory tract.</p>
Sensitization	<p><u>Lomustine</u> See Human Experience.</p> <p><u>Titanium Dioxide</u> Not a dermal sensitizer</p>
Acute Toxicity Study	<p>Acute Oral <u>Lomustine</u> LD50 (rat, males and females): 72 mg/kg LD50 (mouse, females): 38 mg/kg</p> <p><u>Titanium Dioxide</u> LD50 (rat): > 10,000 mg/kg</p> <p>Acute Dermal <u>Titanium Dioxide</u> LD50 (rabbit): > 10,000 mg/kg</p> <p>Acute inhalation toxicity <u>Titanium Dioxide</u> LC50 (rat): > 2.29 mg/l/4 H</p> <p>Acute toxicity (other routes of administration) <u>Lomustine</u> LD50 (rat, intraperitoneal): 50 mg/kg LD50 (mouse, intraperitoneal): 53 mg/kg</p>
Repeated Dose Toxicity	<p><u>Lomustine</u> Assessment Repeat Dose Toxicity See "Human Experience". See Section 11 Target Organs and Symptoms for a description of effects.</p> <p><u>Titanium Dioxide</u> Assessment Repeat Dose Toxicity Several studies were conducted. See "Human Experience".</p>
Genetic Toxicity	<p><u>Lomustine</u></p>

11. TOXICOLOGICAL INFORMATION				
<p>Mutagenicity Assessment This material was positive in a battery of in vivo and in vitro genotoxicity assays.</p> <p><u>Titanium Dioxide</u> Mutagenicity Assessment This material was negative in a battery of in vivo and in vitro genotoxicity assays.</p>				
Carcinogenicity	<p><u>Lomustine</u> 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.</p> <p><u>Titanium Dioxide</u> Carcinogenicity Assessment Tumors were observed at high dose in animal studies by inhalation and intratracheal administration. Tumors were not observed by other routes.</p>			
Carcinogenicity	ACGIH	OSHA	NTP	IARC
Lomustine	--	--	Listed	2A
Titanium Dioxide	A4	--	--	2B
Reproductive Toxicity	<p><u>Lomustine</u> Assessment Reproductive Toxicity Compound may cause injury to male reproductive organs.</p>			
Developmental Toxicity	<p><u>Lomustine</u> Developmental Toxicity Assessment Several developmental studies were conducted. Birth defects were observed in animal studies.</p>			
Human experience	<p>Experiences with Human Exposure</p> <p><u>Lomustine</u> General effects therapeutic use low exposure - acute effects include: nausea, vomiting, diarrhea, loss of appetite, inflammation of the stomach, burning, pain, redness and swelling of skin, bruising, bleeding, hair loss, infection, fever, chills, sore throat, jaundice, shortness of breath, cough, swelling, ataxia, lethargy, confusion, eye effects, changes in skin pigment, blood vessel changes, increased liver enzymes. low exposure - delayed effect include: bone marrow suppression, decreased white blood cell count, decreased red blood cell count, lung toxicity, pulmonary fibrosis. low exposure - long term exposure effects include: cancer.</p> <p><u>Titanium Dioxide</u> Incident report(s) worker exposure low exposure - acute effects include: cough,</p>			

11. TOXICOLOGICAL INFORMATION	
	breathing difficulties, rhinitis, Irritating to respiratory tract..
Target Organs	<u>Lomustine</u> bone marrow, lungs, kidney, male reproductive organs, liver <u>Titanium Dioxide</u> lungs
Symptoms	<u>Lomustine</u> See "Human Experience".
Pharmacokinetics/ Toxicokinetics	<u>Lomustine</u> Absorption: Not available Distribution: Not available Metabolism: Not available Elimination: Half-life = 12 Hour(s) (Human).
Other Toxicity Information	Not available

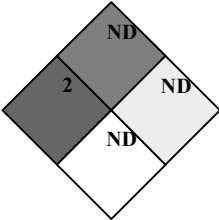
12. ECOLOGICAL INFORMATION	
Ecotoxicological Information (Aquatic)	
Acute Toxicity to Aquatic Invertebrates	
<u>Titanium Dioxide</u> EC50 (Daphnia magna (Water flea), 48 H) : > 100 mg/l.	
Ecotoxicological Information (Terrestrial)	Not available
Chemical fate information	Not available

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.
Other information	Disposal by incineration is recommended.

14. TRANSPORT INFORMATION	
This material is not a dangerous good for the purpose of transportation in all modes.	

15. OTHER REGULATORY INFORMATION	
United States of America	
OSHA Hazard Classification	

15. OTHER REGULATORY INFORMATION	
313 Toxic Release Inventory	No components listed on the SARA 313 inventory.
TSCA Inventory	Not listed. Food, drug and cosmetic products are exempt from TSCA.
International	
Europe	
EINECS/ELIN CS Number	Lomustine: 235-859-2 Magnesium Stearate: 209-150-3 Mannitol: 200-711-8 FD&C Blue No. 2: 212-728-8 Yellow Iron Oxide: 257-098-5 Gelatin: 232-554-6 Titanium Dioxide: 236-675-5
<u>BULK MATERIAL</u>	
<u>DRUG PRODUCT</u>	
Classification	Medicinal products are exempt from classification and labeling requirements under EU Regulation (EC) No 1272/2008.

16. OTHER INFORMATION		
<i>SDS preparation information</i>		
Prepared by	NextSource Biotechnology, LLC 855-672-2468	
Prepared on	11/14/2017	
<i>Other information</i>		
HMIS	Health	2*
	Flammability	Not Determined (ND)
	Reactivity	Not Determined (ND)
	Personal protective equipment	See Section 8.
NFPA	Health	2
	Fire	ND
	Reactivity	ND
	Special	ND
		
The information contained in this SDS 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.		