SAFETY DATA SHEET

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Xenon Xe-133 Gas

Version 5.0 06/16/2020

Product Uses Xenon-133 gas is a radiopharmaceutical that is used to evaluate pulmonary function and cerebral blood flow, and for imaging the lungs. It is administered by inhalation from closed respirator systems and spirometers. Xenon-133 gas is a readily diffusible gas which is neither utilized nor produced by the body. Most of the Xenon-133 gas that enters the circulation from a single breath is returned to the lungs and exhaled after a single pass through the peripheral circulation. It is essentially an inert gas. Overexposure manifests as asphyxiation.

COMPANY IDENTIFICATION: **Lantheus Medical Imaging**
331 Treble Cove Road
Billerica, MA 01862
United States of America
1-800-299-3431

EMERGENCY PHONE: **CHEMTREC 1-800-424-9300.**
For International Transportation Emergencies Call CHEMTREC @ 1-703-527-3887.
Collect Calls are accepted

SECTION 2: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

Appearance Colorless Gas

Signal Word Danger!

Hazard Statements Radioactive.

Precautionary Measures Avoid ingestion, inhalation, skin and eye contact. Care should be taken to minimize radiation exposure. Appropriate radiation shielding should be used. Keep material in a lead container. Avoid direct handling by using remote manipulation tools. Wash hands after handling to minimize exposure. Pregnant or nursing

	women should avoid exposure. Use in a well ventilated environment.
Other Hazards	Asphyxiant in high concentrations
Potential Health Effects	
Eyes	Exposure to ionizing radiation may produce adverse effects.
Skin	Exposure to ionizing radiation may produce adverse effects.
Ingestion	Exposure to ionizing radiation may produce adverse effects.
Inhalation	Exposure to ionizing radiation may produce adverse effects.
Target Organs	Lung; bone; fatty tissue
Signs and Symptoms	Acute: diarrhea, nausea, vomiting, abdominal pain, thirst, fever, difficulty sleeping, tremors, delirium, confusion, convulsions, coma, death. Chronic: Radioactive material: may cause cancer, adverse reproductive effects, embryo/fetal toxicity, hair loss, rash, skin effects, nail changes, pain, weakness.
Environmental Effects	Refer to Section 12

SECTION 3: COMPOSITION INFORMATION ON INGREDIENTS

Substance Xenon-133 Gas

Common Name/Synonym: Xenon gas, Xenon-133, Xe-133 Gas

Hazardous Components

Component	Concentration	CAS
Xe-133 Gas	<0.2% w/w (at calibration)	14932-42-4
Mixture Concentration		
Carbon Dioxide	70-90% w/w	124-38-9
Xenon	10-30% w/w	7440-63-3

SECTION 4: FIRST AID MEASURES

Eye contact	Immediately flush eyes thoroughly with water for 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Obtain medical attention.
Skin contact	Rinse skin with water/shower. Obtain medical attention.
Inhalation	Move to fresh air. Obtain medical attention.
Ingestion	Ingestion is not considered a potential route of entry.
Note to Physicians	Xenon-133 gas is a radiopharmaceutical that is used to evaluate pulmonary function and cerebral blood flow, and for imaging the lungs. It is administered by inhalation from closed respirator systems and spirometers. Xenon-133 gas is a readily diffusible gas which is neither utilized nor produced by the body. Most of the Xenon-133 gas that enters the circulation from a single breath is returned to the lungs and exhaled after a single pass through the peripheral circulation. It is essentially an inert gas. Overexposure manifests as asphyxiation.
Medical Surveillance	A pre-placement physical examination and history for employees with potential exposure to this compound is recommended. Baseline testing would include: EKG, a blood test for liver 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.

SECTION 5: FIRE-FIGHTING MEASURES

Flammable Properties	Material is a non-flammable gas.
Extinguishing Media	Suitable extinguishing media: Dry chemical, Water spray, Foam
Protection of Firefighters	Specific hazards: Radioactive. Protective equipment: Use personal protective equipment. In the event of fire, wear self-contained breathing apparatus. Hazardous Combustion Products: None

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions	Evacuate affected rooms. Contact the company Radiation Safety Officer. Care should be taken to minimize radiation exposure. Handle as radioactive gas release. Refer to protective measures listed in sections 7 and 8. Use personal protective equipment. Depending on the nature of the release (quantity and extent of release) a self-contained breathing apparatus may be needed.
Environmental Precautions	Prevent release to the environment.
Containment Methods	Seal leaking containers.
Cleanup Methods	Allow released gas to clear from the affected area through the building ventilation.

SECTION 7: HANDLING AND STORAGE

Handling Precautions	Avoid exposure. Contact the company/institution Radiation Safety Officer. Care should be taken to minimize radiation exposure. Handling time should be kept to a minimum. Appropriate radiation shielding should be used. Use of syringe shields and tongs are recommended. Keep material in a lead container. Avoid direct handling by using remote manipulation tools. Obtain appropriate governmental licenses to possess and handle radioactive material. Keep away from heat and sources of ignition. *For a complete discussion of Handling and Storage information, please consult the full prescribing information.*
Storage Conditions	Store at room temperature. Storage and disposal of product should be controlled in a manner compliant with applicable governmental regulations pertaining to radionuclides. Store and handle in a designated area. Keep away from heat, sparks and flames.
Container Requirements	Store in sturdy containers appropriate to maintain the integrity of this material for its intended use.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Name	Occupational Exposure Limits
Radionuclides	U. S. Nuclear Regulatory Commission 5 rem/yr whole body dose equivalent

	15 rem/yr lens of eye dose equivalent 50 rem/yr skin of whole body dose equivalent 50 rem/yr extremity dose equivalent 0.5 rem embryo/fetus (surface of the abdomen of pregnant woman over term of pregnancy) 1E-04 µCi/ml derived air concentration International Commission on Radiological Protection 20 mSv/yr effective dose equivalent 150 mSv/yr lens of eye effective dose equivalent 500 mSv/yr skindose equivalent 500 mSv/yr hands/feetdose equivalent
Xenon (7440-64-3)	ACGIH Oxygen Depletion [Asphyxiant] OSHA ---
Carbon Dioxide (124-38-9)	ACGIH TLV Oxygen Depletion [Asphyxiant] STEL: 54000 mg/m³ 15 minutes. STEL: 30000 ppm 15 minutes. TWA: 9000 mg/m³ 8 hours. TWA: 5000 ppm 8 hours. OSHA PEL TWA: 9000 mg/m³ 8 hours. TWA: 5000 ppm 8 hours. OSHA PEL STEL: 54000 mg/m³ 15 minutes. STEL: 30000 ppm 15 minutes. TWA: 18000 mg/m³ 8 hours. NIOSH REL STEL: 54000 mg/m³ 15 minutes. STEL: 30000 ppm 15 minutes. TWA: 9000 mg/m³ 10 hours. TWA: 5000 ppm 10 hours.

Exposure Control Banding Not Available

Lantheus MI Exposure Guidelines Summary Not Available

Recommended Industrial Hygiene Monitoring Methods
Use NAVLAP approved radiation dosimeters to monitor occupational external exposure. Use calibrated portable GM survey meter to measure count rates or calibrated ion chamber to measure exposure rates from contained gas.

Engineering Controls and Ventilation
Use process enclosures, containment technology, or other engineering controls to keep airborne levels below recommended exposure limit.

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.

Eye Protection
Chemical safety goggles and face shields are recommended. Note: Choice of eye protection may be influenced by the type of respirator which is selected.

Hand Protection
Impervious nitrile, rubber and latex gloves are recommended. Please note that employees who are allergic to natural rubber latex should use nitrile gloves.

Skin and Body Protection
Wear a disposable coverall, polyethylene apron and sleeves, and shoe covers.

Hygiene
Wash hands and face before breaks and immediately after handling the product.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Physical State	Gas
Color	Colorless
Odor	Odorless

Physical and Chemical Properties

Molecular Weight	Not Available
Solubility	Soluble
Flashpoint	Not Applicable
Density	Not Available
pH	Not Applicable
Boiling Point	Not Applicable
Melting Point	Not Applicable
Vapor Density	Not Available
Vapor Pressure	Not Available

Radioactive Half-life	5.2 days
Main Radioactive Emissions	31 keV (38%) gamma 35 keV (7%) gamma 81 keV (38%) gamma 346 keV (99%) beta (max) 26 keV (6%) electrons 45 keV (52%) elelctrons 75 keV (8%) electrons

SECTION 10: STABILITY AND REACTIVITY

Chemical Stability	Stable under recommended storage conditions.
Conditions to Avoid	Heat, sparks, flame
Incompatible Products	Not Available
Hazardous Decomposition Products	Not Available
Hazardous Reactions	Hazardous polymerization does not occur.

SECTION 11: TOXICOLOGICAL INFORMATION

Routes of Entry	Inhalation
Eye Irritation	Not expected
Skin Irritation	Not expected
Respiratory Irritation	Not expected
Sensitization	Not expected
Acute Toxicity	Xenon/Carbon dioxide: asphyxiation if oxygen displaced. Carbon dioxide: In high concentrations causes rapid circulatory insufficiency.
Carcinogenicity	Ionizing radiation: exposure known to increase risk of cancer. Xenon/carbon dioxide: not listed by IARC, NTP, OSHA, ACGIH
Reproductive Toxicity	Ionizing radiation: exposure known to increase risk of reproductive and developmental effects.
Developmental Toxicity	Ionizing radiation: exposure known to increase risk of reproductive and developmental effects.

Target Organs	Carbon dioxide: cardiovascular system.
Symptoms	Carbon dioxide: headache, nausea and vomiting, which may lead to unconsciousness.

Section 12 ECOLOGICAL INFORMATION

Environmental Fate:	Not available. Hazardous component, Xe-133 will undergo radiological decay to Cs-133, a non-radioactive isotope of Cesium.
Environmental Toxicity:	Ecotoxicological Information (Aquatic) Not Available
	Ecotoxicological Information (Terrestrial) Not Available

SECTION 13: Disposal Considerations

Advice on Disposal And Packaging	Segregate and label radioactive waste. 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. After use follow local procedures for radioactive waste.
Other Information	This information presented below only applies to the material as supplied.

SECTION 14: TRANSPORT INFORMATION

US DOT Transportation Classification for All Modes
The classification for transportation of radioactive materials will depend on the specific activity level of the material, type of isotope, as well as the quantity shipped. Specific site procedures should be followed for shipping radioactive materials or seek advice from your site radiation safety officer.

SECTION 15: REGULATORY INFORMATION

United States of America

OSHA Hazard Classification	No OSHA Hazards. Note: This regulation does not address radiation hazards.
CERCLA/SARA RQ	Not Listed
313 Toxic Release Inventory.	No components listed on the SARA 313 inventory.

Listed Chemicals/Compounds

TSCA Inventory	Not listed. Food, drug and cosmetic products are exempt from TSCA.

International

Canada

WHMIS	Finished medicinal products are exempt from classification and labeling requirements under the Canadian Hazardous Products Act and Controlled Products Regulations. Note: This regulation does not address hazards related to radioactivity.
DSL/NDSL	Not listed

Europe

EINECS/ELINCS Number	Xenon: 231-172-7, Carbon Dioxide: 204-696-9
Other Information	Medicinal product are exempt from classification and labeling requirements under EU Preparations Directive 1999/45/EC.
Mexico	Health classification - Minimal hazard -0 - Substances that do not pose a hazard under emergency conditions other than that of ordinary combustible materials. Note: This regulation does not address hazards related to radioactivity.

SECTION 16: OTHER INFORMATION

MSDS preparation information

Prepared by	Environment, Health and Safety 1-978-671-8673
Prepared on	06/16/2020

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.