Nephron Pharmaceuticals Corporation
4121 34th Street
Orlando, FL 32811-6458

(407) 246-1389
(321) 388-7024 (24 hour contact)

Effective Date: 05-04-10

MATERIAL SAFETY DATA SHEET

SECTION 1: CHEMICAL SUBSTANCE

PRODUCT NAME: Albuterol Sulfate Inhalation Solution, 0.042%* / Albuterol Sulfate Inhalation Solution, 0.021%*
*potency expressed as albuterol, equivalent to 1.5 mg (0.042%) / 0.75 mg (0.021%) albuterol sulfate.

CHEMICAL NAME: α^1-[tert-butylamino)-methyl]-4-hydroxy-m-xylene-α-α'-diol sulfate (2:1) (salt)

SECTION 2: HAZARDOUS INGREDIENTS

Component	Substance Class	Chemical Formula	M.W.	Approximate Percent Weight/weight	Chemical Abstract Society (CAS) #
Albuterol Sulfate	Beta$_2$-adrenergic bronchodilator	$(C_{13}H_{21}NO_3)_2 \cdot H_2SO_4$	576.71	0.042	51022-70-9
Albuterol Sulfate	Beta$_2$-adrenergic bronchodilator	$(C_{13}H_{21}NO_3)_2 \cdot H_2SO_4$	576.71	0.021	51022-70-9

SECTION 3: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:
This product has been approved for unit dosage identified on the package insert.
Albuterol sulfate is a β_2-adrenergic bronchodilator used for therapeutic effect of the bronchial smooth muscle relaxation. This product is used for the prevention and relief of bronchospasm in patients with reversible obstructive airway disease (asthma) and acute attacks of bronchospasm.

The following adverse effects have been reported with medicinal use of albuterol sulfate and may accompany unintentional exposure in sufficient dose: fine muscle tremors, muscle cramps, nausea/vomiting, headache, dizziness, nervousness, heartburn, and rapid pulse, palpitations, and increased blood pressure.
Extremely rapid heartbeat, seizures, low serum potassium levels, and worsening of the symptoms of pre-existent cardiovascular (heart and blood vessel) conditions and diabetes are possible.

Hypersensitivity reactions (ranging from mild to life-threatening), such as hives, skin rash, constriction of the air passages in the lungs(bronchospasm), and swelling involving the skin and mucous membranes (angioedema) have been reported.

SECTION 4: FIRST AID MEASURES

If In Eyes: Flush affected eye(s) with large amounts of potable water for at least 15 minutes. Obtain medical attention.

If On Skin: Wash affected areas with soap and water after removing contaminated clothing. Obtain medical attention if symptoms or irritation persist.

If Inhaled: If unintentional inhalation or overdose occurs, seek medical attention and remove to fresh air. If individual has trouble breathing, seek medical attention immediately. If individual stops breathing, administer cardio-pulmonary resuscitation (CPR) and seek medical attention immediately.

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If Ingested: If individual is conscious, rinse mouth with water. Never give anything by mouth to an unconscious person or to any individual having convulsions. Seek medical attention if adverse health symptoms develop.

SECTION 5: FIRE-FIGHTING MEASURES

FLASH POINT (C):	Not applicable.
FLAMMABLE LIMITS (LEL/UEL %):	Not applicable.
AUTO IGNITION TEMPERATURE:	Not applicable.
EXTINGUISHING MEDIA:	Water spray, multipurpose dry chemical.
FIRE FIGHTING PROCEDURES:	Wear full protective clothing and use self-contained breathing apparatus (SCBA) in the event of fire where bulk quantities are stored.
FIRE & EXPLOSION HAZARDS:	Not applicable.

SECTION 6: SPILL AND LEAK PROCEDURES

SPILL CONTAINMENT, TREATMENT, AND CLEAN-UP PROCEDURES:

Protective equipment may be necessary for spills, (See Section 8, “Exposure Controls / Personal Protection” for guidance).

For small quantities associated with normal therapeutic use, collect spillage and transfer to a closed waste container for disposal. For large or bulk quantities, collect spillage by collecting with inert absorbent material and place in a labeled, sealed container for proper disposal. Wash spill area (floor or other contact surfaces) with soap and water.

SECTION 7: HANDLING AND STORAGE

HANDLING: Avoid contact with eyes, skin, and clothing. Surfaces should be cleaned if contaminated with this substance. Keep container closed.

STORAGE: Protect from light and excessive heat. Store between 2° and 25° (36° and 77° F).

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS: No special ventilation requirements are needed for normal therapeutic dosage and administration.

PERSONAL PROTECTION:

RESPIRATORY PERTECTION: Not for recommended dosage and administration. See Section 5 “Fire/Explosion Hazards and Fire-Fighting Measures” for respiratory protection in the event of a fire.

EYE PROTECTION: Not required for recommended dosage and administration. Workers should wear adequate eye protection to prevent eye contact.

SKIN PROTECTION: Adequate protective clothing and gloves should be worn when routine handling or spill cleanup may result in skin contact. Wash hands thoroughly after handling this material.

SECTION 9: PHYSICAL / CHEMICAL PROPERTIES

Physical and chemical properties of product determined as a whole.

APPEARANCE AND ODOR:	Clear, colorless and odorless solution.
pH:	3.5
SPECIFIC GRAVITY (H_2O = 1):	≈1
BOILING POINT (C):	100°C
MELTING POINT (C):	N/A
VAPOR PRESSURE:	2 x10^{-5} Pascals @ 25° C
EVAPORATION RATE:	N/D
SOLUBILITY IN WATER:	100%

N/A = Not applicable. N/D = Not determined.

SECTION 10 STABILITY AND REACTIVITY

CHEMICAL STABILITY:	Stable.
INCOMPATIBILITY:	Not determined. No known incompatibilities have been identified for albuterol sulfate (active ingredient).
HAZARDOUS DECOMPOSITION:	Not determined. Thermal decomposition products of albuterol sulfate include toxic and/or corrosive oxides of nitrogen.
CONDITIONS TO AVOID:	Contact with strong acids, bases, or oxidizers.

SECTION 11 TOXICOLOGICAL INFORMATION

PHARMACOLOGICAL ACTIVITY:	Albuterol sulfate is a β_2-adrenergic bronchodilator used for the therapeutic effect of bronchial smooth muscle relaxation. This product is used for the prevention and relief of bronchospasm in patients with reversible obstructive airway disease (asthma) and for acute attacks of bronchospasm.
RECCOMMENDED OCCUPATIONAL EXPOSURE LIMITS:	For albuterol sulfate the estimated safe working level is 10 mcg/m^3 for an eight hour time-weighted average.

REPEAT DOSE TOXICITY: When used medically the following adverse effects have been reported with albuterol sulfate: fine muscle tremors (especially the hands), muscle cramps, nausea or vomiting, headache, vertigo (dizziness), nervousness, heartburn, and rapid pulse, palpitations, and increased blood pressure. Hypersensitivity reactions (ranging from mild to life-threatening), such as urticaria (hives), skin rash, bronchospasm (constriction of the air passages in the lungs), and angioedema (swelling involving the skin and mucous membranes) have rarely occurred. In addition, albuterol sulfate may cause significant changes in blood pressure, extremely rapid heartbeat, seizures, low potassium levels, and may exacerbate the symptoms of pre-existent cardiovascular (heart and blood vessel) conditions and diabetes.

IRRITATION: Albuterol sulfate causes eye irritation; avoid contact with the eyes. Albuterol sulfate is irritating to the nose and throat.

SENSITIZATION: Rarely, exposure to albuterol sulfate can cause an allergic rash with redness and itching of the skin. Exposure by inhalation can cause an allergic rash, difficulty breathing and swelling of the face and airways.

ADVERSE REACTIONS: The following adverse effects have been reported with medicinal use of albuterol sulfate and may accompany unintentional exposure in sufficient dose: fine muscle tremors, muscle cramps, nausea/vomiting, headache, dizziness, nervousness, heartburn, and rapid pulse, palpitations, and increased blood pressure.

Extremely rapid heart beat, seizures, low serum potassium levels, and worsening of the symptoms of pre-existent cardiovascular (heart and blood vessel) conditions and diabetes are possible.

Hypersensitivity reactions (ranging from mild to life-threatening), such as hives, skin rash, constriction of the air passages in the lungs (bronchospasm), and swelling involving the skin and mucous membranes (angioedema) to this substance have been reported.

IMPAIRMENT OF FERTILITY: Reproduction studies in rats demonstrated no evidence of impaired fertility at oral doses of albuterol sulfate up to 50 mg/kg.

PREGNANCY: Teratogenic Effects: Pregnancy Category C:
Albuterol sulfate causes birth defects in mice and rabbits. Rare reports of cleft palate and limb defects in offspring of patients being treated with albuterol sulfate have been received. However, there are no adequate and well-controlled studies of the effects of albuterol sulfate in pregnant women, and no causal relationship between the use of albuterol and adverse pregnancy outcomes have been established.

NURSING MOTHERS: It is not known whether the components of Albuterol Sulfate Inhalation Solution are excreted in human milk.
Precautions should be taken to limit the exposure to these substances while pregnant or nursing; medical evaluation of exposure and attention to compliance with standard operation procedures and/or other workplace health and safety directives is advised.

CARCINOGENICITY: Albuterol sulfate was not carcinogenic in standard tests with mice and hamsters. Albuterol sulfate causes benign tumors to rats treated daily for 2 years with doses which are much greater than the recommended maximum dose for human medical use. The relevance of this finding to humans is not known.

CLINICAL SAFETY: Individuals known to be hypersensitive to β-adrenergic agents like albuterol sulfate should not be exposed. Persons with cardiovascular disorders (including

coronary artery disease, heart rhythm abnormalities and high blood pressure), seizure disorders (epilepsy) hyperthyroidism, or diabetes may experience worsening of symptoms from occupational exposure. Also, persons using albuterol sulfate or other medications in the same therapeutic class (β_2-adrenergic receptor agonists), or taking monoamine oxidase inhibitors or tricyclic antidepressants, may have increased sensitivity to the effects of albuterol sulfate in the occupational setting.

For further product specific information, including precautions, adverse reactions, and dosage, refer to package insert.

SECTION 12 ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE: Albuterol compartmentalizes into the aquatic environment.

ENVIRONMENTAL EFFECTS: Albuterol is not readily biodegradable in water or soil and is unlikely to bioaccumulate. It has toxicity to receptors in the aquatic environment at levels greater than 83.2 mg/L.

ENVIRONMENTAL TEST RESULTS:

STUDY NAME	RESULTS	COMMENTS
Water Solubility	24.5% w/v at pH 7	
Vapor Pressure	2×10^{-5} Pascals at 25° C	
Dissociation Constant	pKa = 9.14	
n-Octanol/Water Partition Coefficient	1.7×10^{-3} at pH 7	
UV/Visible Spectrum	15300 at 225 nm water 1500 at 225 nm in HCl 2400 at 244 nm in NaOH	
Aerobic Biodegradation (soil)	Partial biodegradation in soil 38.7% maximum in clay loam	
Aerobic Biodegradation (water)	Not readily biodegradable	
Soil Adsorption/Desorption	Low adsorption <25%	
Activated sludge respiration inhibition test	>830 mg at 3 hours	
Five day bacterial inhibition	No effect at 18.5 mg/L	
Acute toxicity to Daphnia	LC_{50} = 243 mg at 48 hours	No effect at 83.2 mg/L

SECTION 13 DISPOSAL CONCIDERATIONS

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

SECTION 14 TRANSPORTATION INFORMATION

DOT Proper Shipping Name and Identification Number: Not regulated.

Hazard class: Not applicable.

SECTION 15 REGULATORY INFORMATION

EU packaging and labeling for supply: Salbutamol (albuterol) is not listed under the Chemicals (Hazard Information and Packaging) Regulations, 1993. However, suitable labeling would be:

Indication of Danger (Hazard Symbols):

Harmful and Dangerous for the Environment.

Risk Phrases:	R20/22: Harmful by inhalation and if swallowed. R52: Harmful to aquatic organisms.
Safety Phrases:	S36/37: Wear suitable protective clothing and gloves.
Other Legislation:	Not Determined.

SECTION 16 OTHER INFORMATION

REVISION DATE: 05-04-10 SUPERSEDES: NEW

The information provided herein represents the most reasonable current information available when this assessment was performed. It is believed to be accurate and dependable. Nephron Pharmaceuticals Corp. makes no representation as to the accuracy or sufficiency of this information. This product is indicated as a B_2-adrenergic bronchodilator. Use only as directed by packaging insert. Nephron Pharmaceuticals will assume no liability for the improper use of this product.