BALCHEM™
ANIMAL NUTRITION & HEALTH

Choline Chloride AN&H MSDS - English
Revised: 15 June 2010
Supersedes: 7 October 2009, 12 September 2008, 6 November 2007, 14 September 2007

MATERIAL SAFETY DATA SHEET
According to OSHA Regulation 29 CFR 1910.1200 and Regulation (EC) No. 1907/2006

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:

Dry Products
60% Choline Chloride – Dry
70% Choline Chloride – Dry
75% Choline Chloride – Dry
Choline chloride, 50% on vegetable carrier
Choline chloride, 60% on vegetable carrier
Choline chloride, 70% on vegetable carrier
Choline chloride, 50% on silica carrier

Aqueous Products
70% Choline Chloride – Aqueous
75% Choline Chloride – Aqueous

SYNONYMS: Choline Chloride
2-Hydroxy-N,N,N-trimethylethanaminium chloride

TYPICAL USES: Nutritional Additive for Feed

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24h EMERGENCY PHONE: Not required. If needed, the company can be reached via CHEMTREC at + 1-703-527-3887 [USA]

2. HAZARDS IDENTIFICATION

Emergency Overview

Not classified as hazardous according to US Hazard Communication Regulation (29 CFR 1910.1200), the EEC Dangerous Substance Directive and Dangerous Preparation Directive (67/548/EEC and 1999/45/EC). No risk to the environment expected. Warning! Dry product may form combustible dust concentrations in air (during processing).

Dry Products Light brown to white, free-flowing granules with little to slight grain odor. Poses little or no immediate hazards. Dust may be irritating to eyes, respiratory tract or skin. Combustion/decomposition may release toxic gases such as carbon dioxide, hydrogen chloride gas, nitrogen oxide and carbon monoxide. Deliquescent (absorbs moisture from air and becomes liquid) and may be slippery when spilled. Under appropriate conditions, dust explosion could occur.

Aqueous Product: Colorless to light amber solution; slight amine (fish-like) odor; poses little or no immediate hazards.

Potential Health Effects

Eye: No hazard expected. Dust may cause eye irritation.

Inhalation: No hazard expected. All dusts have potential to irritate respiratory tract. Breathing large amounts of dust may cause injury. Chronic exposure to dust may result in delayed lung injury.

Skin: No hazard expected. Dust may cause skin irritation.

Ingestion: No hazard expected. As a precaution, seek medical attention.

Systemic: No known physiological hazards.

Medical Conditions Aggravated by Exposure: None determined

3. COMPOSITION/INFORMATION ON INGREDIENTS

Also see Section 15.

Product	Components	Weight %	CAS #	Feed Registry #	REACH Reg #	IUPAC Name
CC 35% and 50% on Silica	$C_5H_{14}ClNO$	35-50	67-48-1	Not applicable	Not applicable	*
	$SiO_2 \cdot xH_2O$	50-65	7631-86-9	E 551 a	Not applicable	Not available
	H_2O	< 0.5	7732-18-5	Not applicable	Not applicable	Water
Other Dry Products	$C_5H_{14}ClNO$	50-70	67-48-1	Not applicable	Not applicable	*
	Carrier	30-50	Not applicable			Not applicable
	$SiO_2 \cdot xH_2O$	0-2	63231-67-4	E 551b	Not applicable	Not available
	H_2O	< 0.5	7732-18-5	Not applicable	Not applicable	Water
Aqueous Products	$C_5H_{14}ClNO$	70-75	67-48-1	Not applicable	Not applicable	*
	H_2O	25-30	7732-18-5	Not applicable	Not applicable	Water

*IUPAC Name: (2-hydroxyethyl)trimethylammonium chloride or 2-hydroxy-*N,N,N*-trimethylethanaminium chloride

Exposure Limits

OSHA Nuisance Dust PELs (29 CFR 1910.1000): Respirable fraction = 5 mg/m^3; Total = 15 mg/m^3

Silicon dioxide / Precipitated synthetic amorphous silica (Italy): Respirable dust = 2.4 mg/m^3; Inhalable dust = 6 mg/m^3. Note SiO_2 is a carrier for CC 35% and 50% CC on Silica, and is added as a flow agent to conditioned product only. This silica gel is synthetic amorphous silica not to be confused with crystalline silica. Epidemiological studies indicate low potential for adverse health effects from amorphous silica.

Risk Phrases and Symbols

None

4. FIRST AID MEASURES

Symptoms: Acute – None expected
Chronic – None determined

Eye: As a precaution, flush with clean, low-pressure water for at least fifteen minutes while occasionally lifting eyelids. If irritation occurs and persists, get medical attention.

Inhalation: If there is difficulty breathing, remove to fresh air and get medical attention.

Skin: As a precaution, wash with water, use soap if available. If extensive skin contact occurs, remove contaminated clothing and wash contacted skin with soap and water. In the unlikely event that irritation does occur/persist after contact, check with medical personnel. Wash contaminated clothing before reuse.

Ingestion: As a precaution, seek medical attention.

Note to Physician: Medical attention should not be required. There are no adverse effects expected from exposure to this product. If medical attention is sought, treatment should be based on the judgement of the physician in response to the reactions of the patient.

5. FIRE FIGHTING MEASURES

Flammable Properties: Flash point – Lipids have a flash point > 100 °C (212 °F).

Flammable Limits: Lower Flammable Limit (LFL) – not applicable
Upper Flammable Limit (UFL) – not applicable
Dust Cloud – 250 mg/l for particle size 70 micron or less (based on one sample of Choline chloride, 70% on vegetable carrier.

Auto Ignition Temperature: Not available. Vegetable oil fire may typically occur at temperatures exceeding 357 °C (675 °F). One sample of 70% choline chloride on vegetable carrier yielded a minimum ignition temperature (MIT) of 300 °C (572 °F) for a dust cloud composed of particle size diameter 70 microns or less.

Hazardous Combustion Products: No specific hazards. Combustion will produce compounds of carbon, hydrogen, nitrogen, oxygen and chlorine including carbon monoxide, carbon dioxide, trimethylamine, and hydrogen chloride. The exact composition of the products of combustion will depend on the conditions of combustion.

Other Fire and Explosion Hazards:

Dry products: Possible dust explosion. The particle size as produced and the deliquescent nature of the product are expected to limit potential for dust explosion. Based on minimal samples, material as produced is 0-2 wt% of particle size 70 microns or less. While not fully evaluated for dust explosion properties, material is expected to be classified as ST2 for dry particles less than 75 micron diameter. Literature reports choline chloride for particles < 63 micron diameter and 2.3 wt% moisture is classified as ST1 dust explosion and has a lower explosion limit of 125 g/m^3, overpressure of 3.5 bar, Kst of 4 bar-m/s, a minimum ignition energy (MIE) > 10^6 mJ and an ignition temperature of 430 °C (806 °F). One sample of 70% choline chloride on vegetable carrier at 0.6 wt% moisture and particle size < 70 micron diameter had the following properties: Layer Ignition Test (LIT): No ignition up to 400 °C (752 °F) of 5 mm dust layer, MIE = 30 mJ, Charge Relaxation Time <0.01 seconds yielding classification as quick which implies rapid elimination of charge buildup when grounded / earthed, Powder Volume Resistivity = 2.6 x 10^4 classified as low implying grounding/earthing is likely effective at preventing charge buildup, Pmax = 6.8 bar, Kst=245 bar-m/s and ST=2 (for dust cloud composed of particle 70 micron or less under high turbulence).

Extinguishing Media: Water, Foam, CO_2, Dry Chemical

Fire Fighting Equipment: Full protective equipment (Bunker Gear) and NIOSH/MSHA approved SCBA should be used for all indoor and any significant outdoor fires. For small outdoor fires which may easily be extinguished with a portable fire extinguisher, use of a SCBA may not be required.

Fire Fighting Instructions: Water run off can cause environmental damage. Dike and collect water used to fight fires. Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source, is a potential dust explosion hazard. This material may present an explosion and deflagration hazard risk when dispersed and ignited in air. Secondary explosions may also pose a risk once an initial explosion occurs with the presence of a combustible dust or powder in the area.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: See Section 8.

Environmental Precautions: As good practice, prevent material from entering waterways; collect as much as possible for reuse or disposal.

Cleaning Method: Vacuum or sweep material and place in a disposal container. Dust should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid dispersal of dust in the air (e.g., avoid clearing dust surfaces with compressed air).

7. HANDLING AND STORAGE

General Handling Precautions
Avoid contact with eyes, skin and clothing. Wash thoroughly after handling. Avoid breathing dust. Ensure containers are properly secured before moving. Minimize dust generation and accumulation. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Dry powders can build static electricity charges when subjected to the friction of transfer and mixing operations. Provide adequate precaution, such as electrical grounding and bonding, or inert atmospheres. Applying safety factor to Experimental Minimum Ignition Temperature for dust cloud composed of particles 70 microns or less in diameter suggests keeping the maximum surface temperatures lower than 200 °C where potential for dust cloud formation exists.

Storage Information
Storage temperature. Dry products: Ambient recommended. No known temperature limits. Keep dry in sealed bags. Aqueous products: Ambient recommended. Storage above -18 °C (-0.4 °F) recommended.

Shelf Life: No known limit. Dry products: Use within one year recommended. Clumping may occur under humid conditions. Aqueous products: Discoloration may occur. Use within one year recommended.

Special Sensitivity: None

Miscellaneous: Choline chloride (not encapsulated) is deliquescent (will absorb moisture from air to form a liquid).

Specific Use: No special requirements apply to expected use as a nutritional feed additive.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limits: See Section 3.

Engineering Controls: Provide ventilation and particulate control to maintain airborne levels below the exposure guidelines. It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen-deficient environment. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work are (i.e., there is no leakage from the equipment). Use only appropriately classified electrical equipment and powered industrial trucks.

Eye Protection: Use safety glasses. If there is a potential for exposure to particles which would cause mechanical injury to the eye, wear chemical goggles.

Respiratory Protection: For most conditions, no respiratory protection should be needed; however, in dusty atmospheres, use an approved dust respirator (P2 in Europe). In confined or poorly ventilated areas or emergency and other conditions where the exposure guidelines may be greatly exceeded, use an approved positive pressure self-contained breathing apparatus.

Hand and Skin Protection: As a general precaution, use gloves (PVC or rubber). No additional precautions other than clean body-covering clothing should be needed.

9. PHYSICAL AND CHEMICAL PROPERTIES

Also see Section 5

Product:	Dry Products	Aqueous Products
Appearance:	Pale yellow / tan to light brown, dark brown or off-white granule or powder	Clear to light amber / pale yellow
Physical state:	Solid	Liquid
Chemical Family:	Aliphatic amines	Aliphatic amines
Odor:	Slight amine to grain odor	Faint amine odor
Molecular Formula:	$C_5H_{14}ClNO$ (choline chloride)	$C_5H_{14}ClNO$ (choline chloride)
Molecular Weight:	139.6 (choline chloride)	139.6 (choline chloride)
Specific Gravity:	0.46	1.1
Bulk Density:	450-650 kg/m^3	Not applicable
Solubility:	Choline chloride: 370 g/100 mL water @ 50 °F (10 °C); 506 g/100 mL water @ 100 °F (38 °C); 67.9 g/100 mL methanol @ 50 °F (10 °C); 72.3 g/100 mL methanol @ 100 °F (38 °C)	Completely miscible in water
Octanol/Water Partition Coefficient	Not available	Log Pow < 0
pH:	Choline chloride: 4.5-7.5 for a 25% wt/vol solution	5 - 8 at 10 g/l water @ 20°C
Melting Point:	Choline chloride: Decomposes @ 477°F (247°C)	-0.4°F (-18°C)
Boiling Point:	Not available	>257 °F (>125°C)
Evaporation Rate:	Not available (assumed to be essentially zero)	Not available
VOC Content:	Not available (assumed to be essentially zero)	Not available (assumed to be essentially zero)
Vapor Pressure:	Not available (assumed to be very low)	approximately 15 mmHg @ 25°C, 1 kPa (7.5 mmHg) @ 20°C
Vapor Density (air=1):	Not available	Not available
Viscosity:	Not available	26 mPa.s @ 20°C

10. STABILITY AND REACTIVITY

Chemical Stability:	Stable under normal conditions
Material Incompatibility:	Avoid contact with strong acids and bases as well as iron, mild steel and galvanized steel.
Hazardous Decomposition Products:	Compounds of carbon, hydrogen, nitrogen, oxygen, and chlorine.
Hazardous Polymerization:	None

11. TOXICOLOGICAL INFORMATION (100% Choline Chloride)

LD_{50} – 3400 mg/kg oral (rat)
LD_{50} – 450 mg/kg intraperitoneal (rat)
LD_{50} – 3900 mg/kg oral (mouse)
LD_{50} – 320 mg/kg intraperitoneal (mouse)
LD_{LO} – 735 mg/kg subcutaneous (mouse)
LD_{50} – 53 mg/kg intravenous (mouse)
LD_{LO} – 5 mg/kg intravenous (dog)
LD_{LO} – 25 mg/kg intravenous (cat)
LD_{LO} – 500 mg/kg intraperitoneal (rabbit)
LD_{LO} – 1 g/kg subcutaneous (rabbit)
LD_{LO} – 1100 μg/kg intravenous (rabbit)
LD_{LO} – 1 g/kg rectal (rabbit)
LD_{LO} – 1500 mg/kg (frog)
TD_{LO} – 331 mg/kg/14 weeks continuous oral (rat)
TD_{LO} – 4950 mg/kg/30 days intermittent intraperitoneal (rat)
TD_{LO} – 6250 mg/kg/10 weeks intermittent intraperitoneal (rat)
TD_{LO} – 3564 mg/kg/5 weeks intermittent intraperitoneal (rat)

12. ECOLOGICAL INFORMATION (100% Choline Chloride)

10,000 mg/L 24 weeks (mortality) Coho Salmon, Silver Salmon (oncorhynchus kisutch)
Readily biodegradable

13. DISPOSAL CONSIDERATIONS

Product: Not considered a hazardous waste under Federal Hazardous Waste Regulations (40 CFR 261). Product solutions should be treated in a wastewater treatment plant after securing treatment plant acceptance. Powder or absorbed solution should be landfilled after securing Environmental Regulatory Agency and landfill operations approval. Consult state and local regulations regarding proper disposal as they may be more restrictive or otherwise different from Federal regulations.

Packaging: Dispose of packaging contaminated by product in accordance with regulations.

14. TRANSPORT INFORMATION

EU: As produced, this product is not subject to hazardous material transport regulations in Europe.
US: Not a D.O.T. Hazardous Material (49 CFR 172.101).

Labeling: Containers of this product need no special warning labels. Only a product identity label is needed.

16. OTHER INFORMATION

For safe handling, refer to NFPA 654, *Standard for the prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids*.

Reason for Issue: Updated MSDS to meet conform to requirements / format of the REACH regulation Annex II.

Risk Phrases Used: None used

Hazard Ratings – The following hazard ratings are recommended for this product:

	NFPA
Fire	- 1 for dry products, 0 for aqueous products
Health	- 0
Reactivity	- 0
Specific Hazard	- None

Abbreviations – The following abbreviations may be used in this document:

% - percent
µg/kg - micrograms per kilogram
g/kg – grams per kilogram
lb/ft^3 – pounds per cubic foot
mg/kg – milligrams per kilogram
mg/m^3 – milligrams per cubic meter
mmHg – millimeters of mercury
ppm – parts per million
w/w – Weight per weight
ACGIH – American Council of Governmental Industrial Hygienists
AICS – Australian Inventory of Chemical Substances
CAS – Chemical Abstract Service
CERCLA – Comprehensive Emergency Response, Compensation and Liability Act
CFR – Code of Federal Regulations
CWA – Clean Water Act
D.O.T. – Department of Transportation
DSL – Domestic Substance List (Canada)
ECL – Existing Chemicals List (Korea)
EINECS – European Inventory of Existing Commercial Substances
FDA – Food and Drug Administration
FIFRA – Federal Insecticide, Fungicide and Rodenticide Act
IDLH – Immediately Dangerous to Life and Health
LD_{50} – Lethal dose for 50% mortality of subject species
LD_{LO} – Lethal dose low; the lowest dose of a substance introduced by any route other than inhalation reported to have caused death in humans or animals.
LFL – Lower Flammable Limit
MSHA – Mine Safety Health Administration
NFPA – National Fire Protection Association
NIOSH – National Institute of Occupational Safety and Health
OSHA – Occupational Safety and Health Administration
PEL – Permissible Exposure Limit (default 8-hour day, 40-hour week TWA)
PSM – Process Safety Management
RCRA – Resource Conservation and Recovery Act
REL – Recommended Exposure Limit (default 10-hour day, 40-hour week TWA)
RMP – Risk Management Plan
SARA – Superfund Amendment and Reauthorization Act
STEL – Short Term Exposure Limit (default 15-minute TWA)

TD_{LO} – Lowest dose to which humans or animals have been exposed and reported to produce a toxic effect other than cancer
TSCA – Toxic Substance Control Act
TWA – Time Weighted Average
UFL – Upper Flammable Limit
USDA – United States Department of Agriculture

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