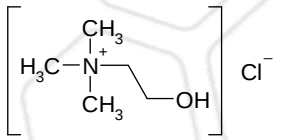
TAMINIZER® CL

Choline Chloride 75% aqueous solution



Technical Data Sheet

Chemical synonym

(2-Hydroxyethyl) Trimethylammonium Chloride; Choline Chloride

General information

CAS number:	67-48-1
Molecular formula:	$C_5H_{14}ClNO$
Molecular weight:	139.6 g/mol
EU Feed Additive Iden. nr.:	3a890

Description

(2-Hydroxyethyl) Trimethylammonium Chloride or Choline Chloride is an essential nutrient and finds its main application as a feed additive.

Taminco produces TAMINIZER® CL: an aqueous solution of Choline Chloride. TAMINIZER® CL is a clear, colorless and nearly odorless liquid.

The standard grade material has a concentration of 75%, which is equivalent to 559 mg/g choline.

Specifications

Property	Specification	Analysis method
Choline Chloride	≥ 75%	Argentometric titration
TMA.HCl	≤ 0.05%	Steam distillation
Water	≤ 25%	---
pH (20°C)	6 – 8	pH
Colour	≤ 25 APHA	Spectrophotometry

Methods of Analysis

In order to determine the exact amounts of choline, we recommend to use a selective method of analysis, for example the Reinecke Salt Gravimetric Method or Ion Chromatography.

Ion Chromatography is a method utilizing the ionizing characteristics of choline. This method can measure the exact amount of Choline Chloride using ionic interactions between the positive ions and negative ions. Also it can detect non-reactive ingredients such as TMA and TMA.HCl and can be used as a test for quality of Choline Chloride products.

When analyzing Choline Chloride with a standard Volhardt method (= chloride method), this common salt will be calculated as Choline Chloride, even though the content of choline is significantly lower than stated.

Principal Applications

Choline is commonly classified as a vitamin. It belongs to the family of water soluble B-vitamins. It was formerly known as vitamin B4.

Like other vitamins, it plays a significant role in nutrition, but its daily requirement seems to be hundreds of times greater than that of other vitamins.

Choline has three essential metabolic functions:

- As a constituent of phospholipids, improving fat transport and cell construction;
- As a precursor in the synthesis of acetylcholine, interacting in muscle control (neurotransmitter);
- As a source of labile methyl groups, essential for numerous biological processes.

Choline occurs in almost all feed ingredients (see for example publications by the NRC); however not all naturally occurring choline is bio-available.

Many animals have a choline requirement that is not fully covered by the natural choline content of the feed.

Therefore extra choline is often supplemented and choline chloride salt is the common form in which choline is added to the feed.

Addition levels vary by species, but are also dependent on age, feed composition, environmental stress and breed. The required addition level is the difference between the requirements on the one hand and the levels of natural available choline on the other. It is further augmented with a safety margin, to cover up for variations of choline levels in natural feed ingredients.

Use in animal feed and drinking water is authorized in the EU, however for poultry and pigs simultaneous use with water for drinking in which Choline Chloride has been added should be avoided.

Dosing

The following supplementation levels reflect average recommendation values for addition of choline to practical diets:

Species		Choline supplement in mg/kg feed (90% dry matter)
Broilers	Starting (0-8 weeks)	500-700
Broilers	Growing (8-18 weeks)	300-600
Layers		250-500
Layers	Breeding	300-600
Turkeys	Starting (0-8 weeks)	800-1000
Turkeys	Fattening (8 – end)	500-700
Turkeys	Breeding	500-700
Ducks	Market/Breeding	900
Pigs	Starting (10-25 kg)	300-600
Pigs	Growing (25-60 kg)	200-400
Pigs	Finishing (60 kg – end)	150-300
Pigs	Gestating/Lactating	150-500
Fish	Depends on species	300-800
Shrimp		400-600
Calves		200-300
Cows		----
Dogs		1000-1200
Cats		1000-1400

These recommendations can serve as a general guideline only, since diet composition and vitamin availability from regular feed ingredients can vary greatly.

The mentioned addition level is expressed in choline and has to be recalculated into an amount of Choline Chloride to be added when drawing up dietary formulations in the feed mill.

1 mg/kg choline = 1.54 g/ton TAMINIZER® CL

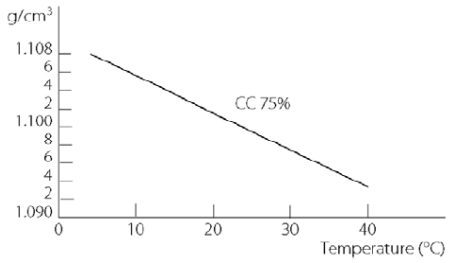
Physical & Chemical Properties

Crystallization point

The crystallization point of liquid Choline Chloride is quite depending on the concentration of the product.
For Choline Chloride 75%, the crystallization point is -10° Celsius. As a comparison, the crystallization point of a saturated liquid product at 78% is +10° Celsius.

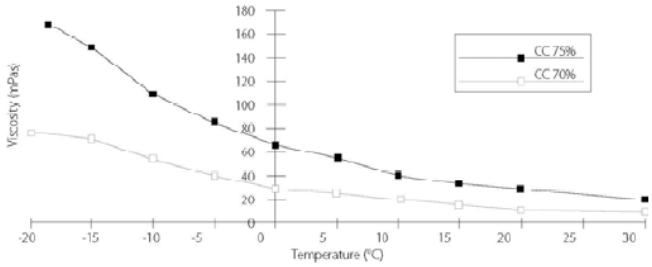
Density

Density at 20°C: 1.1 g/cm³.
Density as a function of temperature:



Viscosity

Viscosity as a function of temperature:



Quality Control & Management

In the interest of its customers, Taminco follows a number of strict rules to guarantee the quality of TAMINIZER® CL as a high valuable feed additive.

Our company is certified ISO 9001 and also owns a GMP certificate and a FAMi-QS certificate for its TAMINIZER® CL.

The product conforms to the specifications set out in the Belgian and European legislation (directives, regulations).

The product is GMO free and complies with European Directives (2002/32/EC, 2006/13/EC and amendments) on impurity levels.

Further we can certify that our product is free of bacteria, viruses, yeast or fungi.

Packaging	• Bulk: roadtanker and flexitainer • PE drums (230 kg net) • IBC containers (1120 kg net)
Shelf-life	24 months (2 years) from production date when stored in closed drums or containers at room temperature.
Storage & Handling	Because TAMINIZER® CL has a corroding effect on blank steel, storage in appropriate materials such as special stainless steel, polyethylene or glass fiber reinforced containers is necessary. Handling in accordance with good industrial hygienic and safety procedures. Breathing, eye and skin protection shall be used during handling.
Transport Regulations	Since Choline Chloride is not referred to in the regulations relating to the transport of dangerous goods, TAMINIZER® CL is not subject to any regulation.
See Material Safety Data Sheet for	Labeling, Toxicology, Ecotoxicology, Physical & Chemical Properties and additional safety information.

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