

CERTIFICATE OF ANALYSIS

Choline Bitartrate (2-Hydroxyethyl)trimethylammonium Bitartrate)

Material Lot #: 203150419 Manufacture Date: 04/10/2015
Country of Origin: China Expiration Date: 04/09/2017

Analysis	Claim	Result
Choline Bitartrate	≥99.0%	99.3%

Test	Specification	Result
Appearance	White Powder	Complies
Moisture	≤0.5%	0.23%
pH (10% Solution)	3.0-4.0	3.5
Residue on Ignition	≤0.1%	0.03%
Heavy Metals	≤10 ppm	≤10 ppm
Lead	≤1 ppm	≤1 ppm
Arsenic	≤1 ppm	≤1 ppm
Cadmium	≤0.1 ppm	≤0.1 ppm
Mercury	≤0.1 ppm	≤0.1 ppm
1,4-Dioxane	Negative	Complies
Total Plate Count	≤1000 cfu/g	Complies
E. Coli	Negative	Complies
Salmonella	Negative	Complies
Staphylococcus aureus	Negative	Complies
Coliform	≤100 cfu/g	Complies
Yeast and mold	≤100 cfu/g	Complies
Assay (on a dry basis)	≥99.0%	99.3%

Choline Bitartrate should be stored at or below room temperature in a tightly sealed durable container. Choline Bitartrate should be protected from excess heat, direct sunlight, excess humidity and moisture. Choline Bitartrate has a stable shelf life of 3 years from the date of manufacture when properly stored.

Choline Bitartrate

- Increases memory
 - Increases cognitive function
 - Essential nutrient
- Choline bitartrate is a salt format of choline, an essential nutrient found in many meat, fish and vegetable products and produced endogenously in minimal quantities
 - Choline benefits include increased memory function, anti-inflammation, reduction of risks of a multitude of diseases, proper functioning of the body and increased cognitive performance
 - Nootropic supplementation of choline bitartrate has been recommended at 550-3000mg daily

Background

Choline is a natural **essential chemical** found in the brain and can be consumed through many food products like meat, fish, eggs, and some vegetables. Choline is a chemical precursor of the neurotransmitter **acetylcholine**, which plays a very important role in the functioning of the brain including **memory and muscle function**. It is this that gives choline its major property as a brain-enhancer. Choline is also added to membrane chemical groups including phospholipids and is therefore important in cellular membrane function. It is an essential nutrient that must be consumed through food and is a member of the **vitamin B group**. Choline bitartrate is a choline salt that makes it easier for the body to absorb.¹

Choline bitartrate effects / benefits

Due to the diversity of the roles that choline plays in the body, choline deficiency has been linked to numerous adverse effects.

Choline supplementation is beneficial in producing a range of effects in the brain.

Memory development

Studies on animals have shown that choline supplementation positively affects brain development in the womb and can reverse some of the negative effects of fetal alcohol syndrome. A human hippocampus will continue to develop until the child reaches 4 years of age. Extrapolating to a human model, choline supplementation during pregnancy and until 4 years of age may be **beneficial to increased memory function for life**.²

Reduces risk of heart disease

Choline is responsible for many functions including the methylation of homocysteine to methionine. High homocysteine levels in the body have been linked to a multitude of ailments including heart disease, cancer, brain function decline and bone fractures. Supplementation with choline has been shown to **reduce homocysteine levels** in the body and thereby lower risk of the above mentioned diseases.³

Anti-inflammatory

Choline-rich diets are known to reduce inflammation markers in the body, lowering the risk of many inflammation-associated diseases including cancer and brain dementia.

"Findings from the ATTICA study indicated that subjects whose diets were rich in choline and betaine had the **lowest levels of several inflammatory markers, including C-reactive protein (CRP), homocysteine, interleukin-6 and tumor necrosis factor**" (Zeisel and da Costa, 2009).⁴

Reduces risk of disease in post-menopausal women

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Product Name	Choline Bitartrate	Product Lot Number	203150419
Report Date	08/04/16	Laboratory #	7486

Test	Method	Result
Choline Bitartrate	USP 38 Titration	99.7%
Mercury	ICP-MS USP <730>	0.360 ppm
Lead	ICP-MS USP <730>	0.009 ppm
Arsenic	ICP-MS USP <730>	0.348 ppm
Cadmium	ICP-MS USP <730>	<0.001 ppm
Total Plate Count	AOAC 966.23	<10 CFU/g
Coliform Count	AOAC 991.14	<10 CFU/g
E. Coli Count	AOAC 991.14	<10 CFU/g
Salmonella	AOAC 998.09	Negative
Yeast and Mold	FDA BAM	<10/<10 CFU/g

Joshua Gray
QA Auditor



08/04/2016 08/04/16
Date

Due to the lower levels of oestrogen in post-menopausal women, a low-choline diet is associated with high risk for a number of diseases including organ dysfunction. Supplementation with choline has been shown to **lower the risk of oestrogen-related disease in postmenopausal women**, even in women with a negative genetic predisposition.⁵

As a precursor for acetylcholine

The main effects of Nootropic choline bitartrate are due to it being a precursor to **acetylcholine**, a very important brain chemical and the first discovered neurotransmitter. Beneficial effects of acetylcholine in the body include proper **functioning of the heart** (evens heart beat and lowers blood pressure) among others. Acetylcholine works via very complex biochemical processes in almost all areas of the body. Its benefits cannot be stated in a few words, and there is still more research being done on all the roles of this wonderful chemical in the functioning of our bodies. In general, it promotes a **healthy, well-functioning body and mind** and lowers the risks of many diseases.

Increases cognitive performance

Low serum choline levels have long been associated with Alzheimer's disease (AD), memory loss and lack of cognitive function. Recently, direct evidence has shown that increasing choline intake not only reduces the risk of AD and memory loss but also **improves cognitive function**. This study involved over 1300 healthy people who underwent MRI scans as well as neuropsychological examinations after answering questions relating to dietary choline-intake.⁶

Choline bitartrate recommended usage

According to many Nootropics websites, the FDA's recommended daily intake of choline is **550mg for men and 425mg for women**. There are many different forms of choline supplements available and some are absorbed faster and more efficiently than others. It is said that lipid versions of choline may have a more efficient absorption than salt-based supplements but this is also up to the consumer to decide. For Nootropics effects, a higher dose may be required. Some Nootropic websites reckon the dose could range from **550-3000mg choline daily**.

Choline bitartrate side effects and warnings

Choline is very well accepted by the body and is a natural precursor to acetylcholine, one of the most important neurotransmitters with functions including memory and proper muscle functioning. There are no reported side effects from choline bitartrate supplementation. If anything, the majority of the population does not consume enough choline for proper bodily functions.

However, as with any supplements, there is a very rare risk of an **allergic reaction**. Since choline is an essential nutrient to the human body, allergic reactions are thought to be extremely unlikely. Should you experience any allergic symptoms, ie rash, itchiness, swollen eyes or throat seek advice from a physician and stop choline supplements.

References

- ¹ "What is Choline Bitartrate? Benefits, Dosage & Side Effects" nootropism.com, retrieved 19-12-2014
- ² "THE FETAL ORIGINS OF MEMORY: THE ROLE OF DIETARY CHOLINE IN OPTIMAL BRAIN DEVELOPMENT" Steven H. Zeisel, MD, PhD, J. Pediatr. Nov 2006; 149(5 Suppl): S131-S136.
- ³ "Choline supplemented as phosphatidylcholine decreases fasting and postmethionine-loading plasma homocysteine concentrations in healthy men." Olthof MR, Brink EJ, Katan MB, Verhoef P, Am J Clin Nutr. 2005 Jul;82(1):111-7.
- ⁴ "Choline: An Essential Nutrient for Public Health" Steven H. Zeisel, M.D., Ph.D., and Kerry-Ann da Costa, Ph.D., Nutr Rev. Nov 2009; 67(11): 615-623.
- ⁵ "Dietary choline requirements of women: effects of estrogen and genetic variation" KA da Costa et al., Am J Clin Nutr November 2010 vol. 92 no. 5 1113-1119
- ⁶ "The relation of dietary choline to cognitive performance and white-matter hyperintensity in the Framingham Offspring Cohort" Rhoda Au et al., Am J Clin Nutr December 2011 vol. 94 no. 6 1584-1591.