# Acetyl L-Carnitine

*Energizing Brain Support**

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Acetyl L-Carnitine delivers 800 mg of Acetyl L-Carnitine (ALC) HCL per serving to support lipid metabolism, cellular health, nerve health, women's reproductive health, healthy pain responses, and cognitive and mental health.* ALC is the acetyl ester of L-carnitine that is endogenously synthesized by the human brain, liver, and kidneys. Individuals may not synthesize enough ALC to meet the demands of the body due to certain conditions or genetic polymorphisms.* Therefore, supplementation may be warranted. When exogenously administered, ALC is readily absorbed due to its amphiphilic structure, and it can move through the plasma membrane and rapidly cross the blood-brain barrier.*

**Benefits***

- Supports cognitive and mental health
- Supports lipid metabolism and cellular health
- Promotes nerve health
- Promotes healthy pain response
- Supports women's reproductive health

### Ingredient Highlights

- Contains 800 mg of Acetyl L-Carnitine per serving
- Gluten-free, dairy-free, and soy free
- Non-GMO

**Supplement Facts**

Serving Size 1 capsule

| Amount Per Serving | | % Daily Value |
|---|---|---|
| Acetyl L-Carnitine HCl | 800 mg | * |

*Daily Value not established.

**Other Ingredients:** Cellulose (capsule), stearates (vegetable source), silicon dioxide.

Research has uncovered numerous clinically relevant benefits of ALC.* ALC facilitates mitochondrial energy production by transferring long-chain fatty acids from the cytoplasm into the inner mitochondrial membrane.[1] ALC provides an acetyl moiety that may be oxidized for energy, used as a precursor for acetylcholine, or incorporated into glutamate, glutamine, and gamma-aminobutyric acid (GABA).[2] ALC may also stabilize lipid membranes and decrease oxidative stress.[1,2] ALC may further metabolize into acetyl-Coenzyme A, thereby acetylating histones, proteins, and enzymes, and modifying gene expression and activity.[2] ALC may hold neuroprotective properties by promoting peripheral nerve regeneration, attenuating neuronal cell death, having analgesic properties, and strengthening nerve growth factor and cholinergic responses.[1-3] ALC may modulate brain neurotransmitters such as acetylcholine, serotonin, and dopamine.[4]

### Cognitive and Mental Health

Research suggests carnitine and ALC influence neuroplasticity, along with neurotransmitter and neuroreceptors functions.[4-6] However, since ALC can cross the hemato-encephalic barrier more readily than carnitine, it may be more helpful in supporting brain health.[5] ALC may be clinically relevant to those with hypoxia-ischemia, traumatic brain injury, Alzheimer's disease, dementia, geriatric depression, chronic fatigue syndrome, multiple sclerosis–related fatigue, and autism spectrum disorders.[2,7] An ALC deficiency was found in patients with major depressive disorder and a history of emotional neglect.[8]

A systematic review and meta-analysis found that patients who supplemented with 1 g to 4 g of ALC per day experienced reduced depressive symptoms compared to a placebo in the general population.[5] ALC supplementation may be particularly helpful for older populations aged 65 and older with depression and comorbid conditions based on clinical studies.[9,10] Rat studies have shown that ALC supplementation may regulate the stress response by improving feedback control of the hypothalamic-pituitary-adrenal axis and restore corticosterone levels.[9] One double-blind, multicenter, randomized controlled trial investigated the effects of ALC in elderly patients suffering from dysthymic disorder. The group of patients who supplemented with 1 g of ALC three times per day exhibited anti-depressive effects compared to a placebo, which was similar to the group taking fluoxetine (an antidepressant drug).[9]

In human and rodent studies, ALC may also increase brain-derived neurotrophic factor (BDNF) levels and upregulate metabotropic glutamate 2 (mGLU2) receptors in the brain, especially in the hippocampus and prefrontal cortex.[4-6] Moreover, ALC regulates GABA and glutamate in the developing brain, reduces serotonin turnover, and enhances dopamine release, dopamine receptor activity, and serotonin levels in the cerebral cortex.[4,5] Human, rodent, and in-vitro studies show ALC supplementation may protect against acute stress exposure, restore synaptic function, enhance cholinergic activity, and exert neurotropic effects.[5-7] Furthermore, ALC is able to supply acetyl groups needed for the synthesis of fatty acids, such as omega-3 fatty acids, which are essential for neuronal membrane integrity.[9]

A systematic review examined ALC supplementation ranging from 2 g to 6 g twice per day between 1 and 3 months on hepatic encephalography, a neurological disorder that may arise from acute or chronic hepatic failure. The researchers concluded that the group of patients who supplemented with ALC had reduced serum ammonia levels and improved psychometric tests in encephalopathy patients versus a placebo.[1] Human studies have shown that 4 g of ALC supplementation per day may also promote neurophysiological activities relating to concentration, psychomotor speed, mental flexibility, short-term memory, computing ability, and visual scanning and tracking.[11]

**Nerve Health and Healthy Pain Response**

The neuroprotective properties of ALC have been studied in patients with central or peripheral nerve system injuries.[2] In fact, ALC deficiency has been observed in those patients who have diabetic peripheral neuropathy (DPN), which impacts approximately 30% to 50% of diabetic patients.[12] A multicenter, randomized, double-blind, controlled trial (n = 232) administered 500 mg of ALC three times per day for 24 weeks to diabetic patients with abnormal nerve connection tests. The group supplemented with ALC experienced improved clinical symptoms with well tolerance and neurophysiological parameters compared to the placebo.[12]

One meta-analysis observed that patients with human immunodeficiency virus–related peripheral neuropathy and DPN who supplemented with a minimum of 1,000 mg of ALC per day experienced reduced pain by 20.2% compared to baseline. The patients who supplemented with ALC also exhibited improved nerve conduction parameters and nerve fiber regeneration.[3] Human clinical trials have found that ALC may be supportive in the setting of peripheral neuropathy induced by chemotherapy or antiviral treatments.[12]

Based on human and rodent studies, ALC may be supportive of analgesic properties in the management of neuropathic- and neoplastic-based pain.[4] ALC may modulate the acetylation of histones through epigenetic activity, thereby affecting chromatin status, gene expression, and regulation of transcriptional coactivators, nuclear receptors, and transcription factors such as nuclear factor-kappa B.[2,4,6] In mice studies, ALC increases the mGlu2 receptors that regulate pain transmission in the spinal cord, limiting the transmission of nociceptive stimuli and counteracting central sensitization.[4] Studies have shown that animals given ALC supplementation experienced a lowered pain threshold, potentially due to the activity of cholinergic nerves.[13]

A systematic review and meta-analysis evaluated the efficacy and safety of ALC supplements in patients with diabetic and nondiabetic peripheral neuropathic pain (PNP). The researchers observed that the group of patients who took approximately 2,000 mg of ALC per day showed reduced PNP, especially diabetic PNP.[13]

Additionally, a multicenter, double-blind clinical trial (n = 82) examined the neuroprotective properties of ALC in patients with mild-to-moderate carpel tunnel syndrome. All subjects received 500 mg of ALC twice per day for 4 months. The patients receiving ALC supplementation showed improved median nerve-sensory conduction velocity and sensory function and pain.[14]

**Women's Reproductive Health**

ALC may support women's reproductive health.* ALC is abundant in the hypothalamus and influences the neuronal activity of the hypothalamic-pituitary-gonadal axis.[15] ALC may support female fertility by directly increasing energy production, reducing oxidative stress to reproductive cells, and promoting oocyte growth and maturation by decreasing the rate of apoptosis.[15,16] Animal and human studies suggest ALC may also increase reproductive hormones, such as estradiol, progesterone, and luteinizing hormone.[16] One study administered 1 g per day of ALC for 16 weeks to patients suffering from functional hypothalamic amenorrhea. The patients receiving ALC supplementation showed increased luteinizing hormone by counteracting certain neuroendocrine pathways that have an inhibitory effect on the reproductive axis.[16] Both animal and human studies have demonstrated that subjects supplementing with ALC experienced an increase in fertility and pregnancy rates in the setting of polycystic ovary syndrome by promoting mitochondrial functions, maintaining glucose metabolism, and lowering oxidative stress.[15,16]

**Recommended Use:** Take 1 capsule per day or as directed by your health-care practitioner.

For a list of references cited in this document, please visit:

https://www.designsforhealth.com/api/library-assets/literature-reference---acetyl-l-carnitine-tech-sheet-references

Dosing recommendations are given for typical use based on an average 150 pound healthy adult. Healthcare practitioners are encouraged to use clinical judgement with case-specific dosing based on intended goals, subject body weight, medical history, and concomitant medication and supplement usage.



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