designs for health®

NAC

*N-Acetyl-L-Cysteine for glutathione synthesis and detoxification**

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This information is provided as a medical and scientific educational resource for the use of physicians and other licensed health-care practitioners ("Practitioners"). This information is intended for Practitioners to use as a basis for determining whether to recommend these products to their patients. All recommendations regarding protocols, dosing, prescribing, and/or usage instructions should be tailored to the individual needs of the patient considering their medical history and concomitant therapies. This information is not intended for use by consumers.

Designs for Health offers N-Acetyl-L-Cysteine in 900 mg per 1-capsule serving. N-acetyl-L-cysteine (NAC) is a potent amino acid precursor to glutathione (GSH), one of the body's most powerful intracellular antioxidants that supports optimal phase II hepatic biotransformation (liver detoxification).* NAC is the most stable nutritional supplement form of the amino acid L-cysteine.* NAC also plays a critical role in supporting lung health, reproductive health, muscle recovery post-workout, and healthy inflammatory responses.* Furthermore, due to the presence of a sulfhydryl group (–SH), NAC may be clinically relevant to those with potential heavy metal exposure and other harmful toxicants.* NAC is prominently found in *Allium* plant species, especially onions.

Formula Highlights

- Contains 900 mg per 1-capsule serving of N-acetyl-L-cysteine (NAC)
- Delivers a precursor to glutathione — the body's most powerful antioxidant*
- Gluten-free, dairy-free, and soy-free
- Non-GMO

Benefits*

- Supports healthy liver function and detoxification[1,2]
- Supports antioxidant status and healthy inflammatory responses[1,3,4,6,15]
- Promotes brain and nervous system function[1,13-17]
- Supports lung health[8-11]
- Supports reproductive and metabolic health[4,5,7]
- Promotes muscle function and recovery[1,18]

Supplement Facts

Serving Size 1 capsule

Amount Per Serving	% Daily Value
N-Acetyl-L-Cysteine 900 mg	*

*Daily Value not established.

Other Ingredients: Cellulose (capsule), vegetable stearate, silicon dioxide, ascorbyl palmitate.

NAC120-14A

Liver Detoxification Support*

NAC is a potent amino acid that promotes intracellular GSH levels. GSH is critical for liver detoxification of heavy metals, other xenobiotics, and systemic antioxidant support to help protect against oxidative stress and free radical accumulation. NAC has been shown in human research to help protect the liver from the damaging effects of excessive alcohol use.[1] Supplementation of NAC attenuates this toxicity by inhibiting acetaldehyde build-up and hepatocyte necrosis from acetaminophen poisoning by raising GSH levels and mitigating severe oxidative damage.[1] L-cysteine has been shown to have a high affinity for mercury and other heavy metals, such as copper, lead, and cadmium; thus, it may help to bind to them and aid in their removal from the body.[1,2] When GSH levels are low, the liver is vulnerable to damage from these toxins.

Reproductive and Metabolic Health*

In human studies, NAC has been shown to be clinically relevant to male and female reproductive health, as it enhances enzymatic antioxidant activity.[3,4] Several studies from a systematic review showed that individuals receiving 600 mg of NAC had reduced reactive oxidative species (ROS) levels, significantly improved sperm motility and volume, and reduced viscosity compared to a placebo.[4] Another review found that PCOS women with hyperinsulinemia (n = 46) who were administered 1.8 g per day of NAC had significantly improved insulin sensitivity.[5] After 6 weeks of supplementation, the women receiving NAC had increased ovulation rate, high-density lipoprotein cholesterol levels, and decreased weight, body mass index, fasting blood glucose, total cholesterol levels, low-density cholesterol, and Homeostatic Model Assessment for Insulin Resistance levels.[5]

In an in vitro experimental study of hyperglycemia-induced injury of cardiomyocytes, NAC administration showed similar mitochondrial energetic and cellular viability effects as metformin; however, NAC demonstrated more noticeable effects in mitigating ROS production within the cytosol and mitochondria and increased the production of CoQ10, which was significantly reduced by high glucose exposure.[6] A systematic review exploring the ameliorative effects of NAC in obesity-associated metabolic complications such as metabolic syndrome showed that individuals who were administered NAC supplements had attenuated oxidative damage, improved abnormal pro-inflammatory responses, inhibited lipid accumulation by targeting adipogenic transcription factors (e.g., peroxisome proliferator-activated receptor gamma), and improved insulin sensitivity by enhancing the PI3K and AKT pathways in both in vitro and in vivo models of obesity.[7]

Lung Health*

NAC works to break up the sulfide bonds that are responsible for thickening mucus function.[8] Thus, by thinning mucus viscosity, NAC may promote healthy respiration patterns and support healthy lung function.[8] A review demonstrated that NAC may help support immune health by promoting mucus elimination.[9] In a meta-analysis examining the influence of NAC on chronic bronchitis (CB) and chronic obstructive pulmonary disease (COPD) exacerbations, the results showed that patients receiving NAC supplementation (between 600 mg/day and 1,200 mg/day) had significantly fewer COPD or CB aggravations and that NAC was generally well tolerated.[10] Its protective effect was more evident in those with no signs of airway obstruction.[10]

A review investigating the use of NAC in biofilm-related respiratory infections (i.e., chronic bronchitis, chronic obstructive pulmonary disease, and rhinosinusitis) suggested that NAC may promote healthy microbial environments by attenuating biofilm formation, disrupting pre-existing mature and infant biofilms, and reducing bacterial growth within biofilms.[11] The researchers state that biofilm formation is responsible for many acute and chronic pulmonary events and there is a need for non-antibiotic therapy, as many biofilm strains are resistant to conventional antibiotics.[11] Animal studies have shown that NAC has a significant antioxidative effect on airway hyper-responsiveness, which is caused by a consistent presence of pro-inflammatory mediators and immune cells in the airways, and steroid-resistant inflammation in acute asthma.[1]

Brain and Central Nervous System Health*

Human studies show that the accumulation of mercury in the brain has the ability to increase lipid peroxidation, mitochondria breakage, depletion of GSH, and protein DNA oxidation — all critical factors in the development of neurodegenerative diseases, such as Alzheimer's disease and Parkinson's disease.[12] Oxidative damage may be the common linkage between these factors. A review finds NAC to be clinically relevant in supporting mental health due to its ability to cross the blood-brain barrier and provide the brain with cysteine for glutathione production.[13] In turn, this may help to protect neuronal mitochondria from programmed cell death, ROS, and memory loss seen in cognitive aging dementia patients, and it may help to enhance brain synaptic and non-synaptic activities.[1,13,14]

In addition, NAC has been shown to benefit brain health in individuals suffering from strokes and traumatic brain injuries (TBIs), which have been mediated by attenuating oxidative stress, free radicals, and pro-inflammatory mediators.[15] After 7 days of NAC administration (4 g/day of NAC for 4 days initially and 3 g/day of NAC for 3 days), soldiers who experienced TBIs after blast exposures had significantly improved symptom resolution compared to the placebo group.[15]

Relating to the effect NAC has on neuropsychiatric health, a 6-month pilot study of NAC supplementation (with 2,700 mg/day) increased functional connectivity within the cingulate cortex in early psychosis patients compared to the controls. The results indicated that increased brain GSH through NAC supplementation has a positive effect on functional connectivity within the brain.[16]

Since NAC modulates the cellular distribution of the amino acid glutamate, a systematic review investigated the effects of NAC in those with obsessive-compulsive disorder (OCD).[17] The individuals receiving 2,400 to 3,000 mg per day for an average of 12 weeks demonstrated positive results in reducing the severity of OCD symptoms with minimal adverse effects and good tolerability.[17]

Musculoskeletal Health*

After a strenuous workout, free radicals are produced as a natural result of vigorous muscle contractions. Although glutathione diligently works to scavenge the excess free radicals, NAC quickly rebuilds the body's glutathione supply. In vivo studies show that NAC can support muscle performance and efficient muscle recovery after workouts and during periods of muscle exertion.[1] NAC is a potent scavenger of free radicals and oxidative stress, which play a causal role in muscle fatigue.[1] In vivo and in vitro animal models of osteoarthritis (OA) demonstrate that oral NAC therapy significantly inhibited the downregulation of collagen II expression in chondrocytes, which is indicative of OA, and significantly inhibited ROS accumulation and pro-inflammatory cytokine expression, suggesting potential benefits to those with OA.[18]

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---n-acetyl-l-cysteine-tech-sheet-references

Dosing recommendations are given for typical use based on an average 150-pound healthy adult. Health-care 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.

***These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.**

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