

# C-Nergy with D-Ribose



## Recovery, Energy, and Immune Support

### Key Features:

- High-dose (1,000 mg) vitamin C with active B-vitamins and essential minerals/electrolytes to support metabolism and tissue regeneration
- D-Ribose (5 g/d) & Taurine (500 mg/d) for energy production and cardiovascular support
- Certified organic elderberry juice concentrate, mixed carotenoids & zinc to support immune function

### Description:

**C-Nergy** is a high-dose vitamin C drink fortified with D-ribose, taurine, active B-vitamins and essential minerals to support mitochondrial integrity, cardiovascular health, immune system, and performance & recovery.

### D-Ribose – The “Energy Currency” of the Mitochondria

Once considered the powerhouse of cells exclusively, mitochondria are now recognized to carry out multiple essential cellular functions beyond energy production, such as apoptosis control, intracellular signaling, production and elimination of reactive oxygen species, and the control over gene expression.<sup>[1]</sup> **Mitochondrial integrity and function are implicated in many chronic diseases, including neurodegenerative diseases, myopathies, diabetes, and cardiovascular disease.**

D-Ribose, unlike D-glucose, is a 5-carbon sugar molecule that does not spike serum insulin levels. It is an energy-producing substrate of adenosine triphosphate (ATP) nucleotide through the pentose pathway. The pentose pathway (Figure 1) starts with D-glucose being converted to D-glucose-6-phosphate via a rate-limiting enzyme glucose-6-phosphate dehydrogenase (G6PD) and continues to yield 5-phospho-D-ribose 1-pyrophosphate (PRPP), the precursor of ATP and nucleotides.

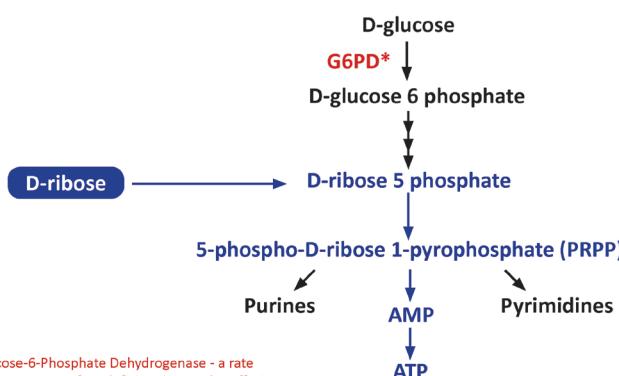


Figure 1. D-ribose supplementation bypasses multiple reactions of the pentose pathway.

However, in individuals suffering from chronic diseases such as congestive heart failure, G6PD is often found to be deficient,<sup>[2]</sup> further compromising the ATP production in the mitochondria and worsening the disease outcomes.

D-ribose is able to bypass multiple steps of the pentose pathway, including the rate-limiting G6PD, and, therefore, is a viable alternative source of PRPP for chronic diseases associated with

**Quantity: 340 grams (powder)**

**Serving Size 1 Scoop      30 servings per container**

**Ingredients (per scoop):**

Vitamin C (L-ascorbic acid).....	1,000 mg
Vitamin D3 (cholecalciferol) (100 IU).....	2.5 mcg
Vitamin E (d-alpha tocopheryl acetate) (18 IU).....	12 mg
Vitamin B1 (from thiamine hydrochloride).....	0.5 mg
Vitamin B2 (from riboflavin 5'-phosphate sodium).....	0.5 mg
Niacinamide.....	5 mg
Vitamin B6 (from pyridoxal 5'-phosphate calcium).....	10 mg
Folate (from calcium L-5-methylfolate).....	50 mcg
Vitamin B12 (methylcobalamin).....	30 mcg
Biotin.....	10 mcg
Vitamin B5 (from calcium d-pantothenate).....	10 mg
Calcium (from calcium bisglycinate).....	50 mg
Iodine (from potassium iodide).....	45 mcg
Magnesium (from magnesium citrate).....	80 mg
Zinc (from zinc gluconate).....	5 mg
Selenium (from selenium glycinate).....	50 mcg
Manganese (from manganese bisglycinate).....	500 mcg
Chromium (from chromium nicotinate glycinate).....	50 mcg
Molybdenum (from molybdenum bisglycinate).....	500 mcg
Sodium (from sodium bicarbonate).....	145 mg
Potassium (from potassium citrate and bicarbonate).....	200 mg
Alpha Lipoic Acid.....	20 mg
Mixed Carotenoids.....	300 mcg
Lutein (FloraGLO®) (free-form).....	.25 mcg
Quercetin.....	30 mg
Taurine.....	250 mg
Glycine.....	15 mg
L-Lysine (from L-lysine hydrochloride).....	15 mg
L-Leucine.....	15 mg
L-Cysteine.....	15 mg
Elderberry Juice Concentrate (5:1) (Certified Organic).....	2,400 mg ( <i>Sambucus nigra canadensis</i> ) (equivalent to 12 g of fresh fruit)
D-Ribose.....	2,500 mg

**Other Ingredients:** Mixed berry flavour, Stevia extract, erythritol (certified organic), citric acid, microcrystalline cellulose

**Suggested Use:** Adults - take 1 scoop, 1-2 times per day, or as directed by a health care practitioner. Mix each scoop with 4-6 oz of water. Take a few hours before and after taking other medications.

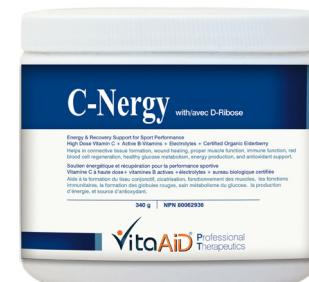
mitochondrial dysfunction.

### Clinical Use of D-Ribose in Congestive Heart Failure (CHF)

ATP is essential for myocardial cellular integrity and function. Ischemia in the myocardial tissue has been shown to cause a reduction in myocardial ATP levels and a suppression of diastolic function, suggesting that an insufficient supply of ATP may play a part in the disease progression of Congestive Heart Failure (CHF).

The repletion of ATP levels in myocardial cells following ischemia depends on the availability of the precursor PRPP and may take more than 72 hours to recover even after reperfusion, potentially rendering the tissue to further damage.

**D-ribose can enhance ATP synthesis by directly increasing PRPP levels.**



In a placebo-controlled RCT,<sup>[3]</sup> D-ribose (60g/day) was shown to significantly improve the heart's tolerance to ischemia in 20 severe coronary artery disease (CAD) patients undergoing symptom-limited treadmill exercises ( $p=0.002$ ). The results were based on the time it took for the CAD subjects to show ST-depression and moderate angina on the monitors during the exercises. This trial demonstrated D-ribose's beneficial effect on the myocardial cells even under the extreme stress of the heart.

In another double-blind, crossover RCT involving 15 patients with chronic CAD and CHF,<sup>[4]</sup> the researchers were investigating the use of D-ribose to help improve the health parameters of **left ventricular diastolic function, the most important therapeutic goal in CHF**. The subjects were first randomized to receive either oral d-ribose (5g TID) or placebo for 3 weeks, followed by a 1-week washout period, and were administered with the other supplement for another 3 weeks. The results showed that d-ribose was able to **significantly improve the left ventricular filling, reduce the left atrial enlargement** ( $p=0.02$ ), and normalize E wave deceleration (ie. **improved left atrial filling**;  $P=0.002$ ), all of which showed an improvement in the overall left ventricular diastolic function. D-ribose also significantly **improved the patient's quality of life** ( $p<0.01$ ).

#### D-Ribose for Chronic Fatigue Syndrome & Fibromyalgia

Both chronic fatigue syndrome (CFS) and fibromyalgia (FMS) are debilitating syndromes currently affecting 3-5% of world populations. While the pathogenesis of the diseases is yet to be elucidated, both conditions are closely associated with mitochondrial dysfunction.

In a pilot clinical study involving 41 patients with FMS and/or CFS,<sup>[5]</sup> the patients were administered with 5 g of D-ribose, 3 times a day, until the 280 g bottle was consumed (approximately 18 days). Approximately 66% of patients reported significant improvement in terms of energy and overall well-being ( $p<0.0001$ ).

#### D-Ribose for Performance & Recovery

Skeletal muscle cells have higher demands for ATP storage than most other cells, and for such a reason, require more extended time and effort to replenish and maintain their intracellular ATP levels. For instance, following a prolonged, repeated high-intensity exercise, reaching the anaerobic threshold, ATP levels can be depleted so severely in skeletal muscle that they may take a few days to recover, especially for people who don't undergo regular high-intensity training exercises.

In a double-blind, crossover RCT involving 26 healthy volunteers,<sup>[6]</sup> the subjects were randomized to receive either 10 g of D-ribose or 10 g of dextrose per day. The intervention was comprised of a 2-day loading phase (ie. resting) with just the supplementation, followed by 3 days of high-intensity interval exercise with supplementation. The peak oxygen intake (VO<sub>2max</sub>) and power output (PO) were measured in all subjects. Then the subjects were separated into two groups: higher VO<sub>2max</sub> (ie. well-trained athletes) and lower VO<sub>2max</sub> (ie. regular individuals). The results demonstrated that D-ribose **significantly improved the PO in those with lower VO<sub>2</sub> compared to dextrose**. Moreover, the rate of perceived exertion and creatine kinase levels were both significantly

lower when taking D-ribose than when on dextrose.

#### Taurine

Taurine is a beta-amino acid found in most cells, with levels particularly high in excitable tissues such as muscles and nerves. It exerts multiple cytoprotective actions, such as an antioxidant, energy metabolism, gene expression, neuromodulation, and osmoregulation of Ca<sup>2+</sup>.<sup>[7]</sup>

Taurine has been shown to lower blood pressure in hypertensive patients<sup>[8]</sup>, reduce atherosclerotic plaques<sup>[9]</sup>, support mitochondrial function<sup>[10]</sup>, improve the clinical outcome of metabolic syndrome<sup>[11]</sup>, and support skeletal muscle functions.

#### Elderberry Juice Concentrate

Elderberry (*Sambucus nigra*) is traditionally used to relieve symptoms of colds and flu, promote sweating (diaphoretic), and waste excretion (alterative).

In an RCT involving 312 intercontinental air travelers,<sup>[12]</sup> the volunteers were randomized to receive either elderberry extract or placebo before and after travels. The subjects were assessed by filling out questionnaires that look at the total number of cold episode days, perceived stress, general well-being, quality of life related to respiratory symptoms at baseline (-10 days), before travel (-2 days), and after travel (+4/5 days). The results showed that the elderberry group had a **significantly shorter duration of cold episode days** (57 vs 117;  $p=0.02$ ), as well as **significantly lower average symptom score** (247 vs. 583;  $p=0.05$ ).

**Vitamin C** is involved in many important biochemical reactions, supporting multiple systems, including the nervous system, tissue formation, antioxidant, and immune function.

**Zinc** has been shown to help enhance cell-mediated immune response and support tissue formation and energy metabolism.

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