



# PRO-B-COMPLEX

- Provides Baseline Nutrition for a Variety of Protocols
- Builds Metabolic Reserve and Protects Against Dietary Deficiencies
- Protects Against Stress-Induced Nutrient Depletion
- Supports Healthy Metabolism

This product is a balanced and comprehensive B complex supplement that contains eight essential B vitamins, along with choline, inositol, and folate as Quatrefolic™ - 100% 5-MTHF, the biologically active form of folic acid for optimal methylation. B vitamins have historically been taken together for their synergistic role in supporting energy production, immune health, cardiovascular health and neurological health. Adequate B vitamins are essential for maintaining energy levels and additional intake is often needed by those with high levels of stress. This product offers high-quality nutrients, which help to build a healthy micronutrient reserve.

## Overview

A wide and complex variety of B vitamins is essential for the body to convert food into cellular energy. These water-soluble groups of vitamins are first absorbed in the small intestine and then travel to the liver where they are biotransformed into their active coenzyme forms. One of the key roles of B vitamins is to serve as prime coenzymes for the Krebs cycle, the biochemical pathway responsible for maintaining energy production in the form of cellular energy. In addition, B vitamins, particularly folic acid, B6 and B12, are critical for proper methylation, a biochemical process that helps convert the problematic amino acid metabolite homocysteine into the amino acids methionine and cysteine. This process is vital for supporting cardiovascular and mental health, a healthy nervous system, regulating gene expression, proper energy metabolism, as well as immune and nerve cell function. Methylation occurs billions of times every second and helps the body to repair DNA on a continual basis. However, when methylation processes in the body slow down, an increase in the breakage of DNA strands can occur. In addition to maintaining DNA repair, methylation reactions help maintain optimal neurotransmitter production,

homocysteine balance for cardiovascular health, recycle molecules that are required for detoxification and support a healthy inflammatory response. Proper methylation can be inhibited by nutrient deficiencies including folate, B2, B6 and B12.

## Deficiency†

Deficiency in any of the B vitamins can create a breakdown of metabolic processes that protect health. Many medications deplete certain B-vitamins including acetaminophen, aspirin, ibuprofen, oral contraceptives and SSRIs, along with stress and poor diet. Deficiencies of folic acid, B6 and B12 can specifically impair proper methylation, which affects many aspects of health.

## Folate†

Folate is a water soluble member of the B complex vitamins that is critical for maintaining optimal methylation. Folate is found naturally in foods such as fruits and dark leafy vegetables, but can be easily destroyed by cooking or processing. Additionally, enzyme defects, malabsorption and congenital deficiency of 5-methylenetetrahydrofolate reductase (5-MTHFR), an enzyme required for the conversion of folic acid to its bioactive form 5-methyltetrahydrofolate (5-MTHF), can result in an impaired ability to activate folic acid. In individuals with a genetic defect of this enzyme, supplementation with 5-MTHF has been shown to be beneficial.<sup>[1]</sup> 5-MTHF is required as a methyl group donor for the production of mood regulating neurotransmitters such as serotonin, the synthesis of melatonin, as well as DNA production and repair.<sup>[1]</sup> 5-MTHF also donates its methyl group to vitamin B12 (cobalamin), forming methylcobalamin. Methylcobalamin helps convert the amino acid metabolite homocysteine into the amino acid methionine. Consistent recycling of homocysteine is vital to supporting cardiovascular and arterial health.<sup>[1]</sup>

† 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.

## Thiamine (Vitamin B1)<sup>†</sup>

While naturally abundant in whole grains, thiamine is lost in many of the over-processed grains commonly consumed today.<sup>[2]</sup> Thiamine is an essential co-factor in the production of ATP in the cells' Krebs cycle, and is also needed for the metabolism of fats, proteins and carbohydrates.<sup>[3]</sup> A recent randomized double blind placebo-controlled trial found that supplementation with high-dose thiamine also supports blood sugar balance.<sup>[4]</sup>

## Riboflavin (Vitamin B2)<sup>†</sup>

Riboflavin is a precursor to flavin adenine dinucleotide (FAD) and flavin mononucleotide (FMN), both of which are central to energy production, intermediary metabolism, and act as powerful antioxidants.<sup>[5]</sup> Riboflavin-depleted cells have been found to display signs of greater oxidative stress and disrupted energy generation.<sup>[6]</sup> Studies have also shown that optimal riboflavin status has been found to help maintain healthy blood pressure already within normal range in patients with certain genetic predispositions.<sup>[7]</sup>

## Niacin<sup>†</sup>

Niacin is a cofactor in the mitochondrial respiratory chain, which produces cellular energy.<sup>[8]</sup> In the body, niacin is transformed into NAD (Nicotinamide adenine dinucleotide) and NADP (Nicotinamide adenine dinucleotide phosphate), which both play a role in oxidation reduction reactions in cells.<sup>[9]</sup> Niacin or nicotinic acid has a long history of use in cardiovascular health, having been shown in numerous studies to support endothelial health.<sup>[10,11]</sup>

## Vitamin B6<sup>†</sup>

Vitamin B6 is involved in over 100 enzymatic reactions in the body and is essential for gluconeogenesis, lipid metabolism, neurotransmitter formation, immune health and hormone modulation,<sup>[11]</sup> and is essential in methylation, for the breakdown of homocysteine. A large, prospective study found that women who consumed, on average, 4.6 mg of vitamin B6 daily had significantly better markers of cardiovascular health compared to women who consumed an average of 1.1 mg daily.<sup>[12]</sup> In addition, vitamin B6 has been found to promote normal lymphocyte proliferation and interleukin-2 production in older people, both of which are important for optimal immune function.<sup>[13,14]</sup>

## Vitamin B12<sup>†</sup>

Vitamin B12, found only in organ meats, seafood and egg yolks, often becomes deficient in vegan and vegetarian diets. The vitamin is essential for the metabolism of fats and carbohydrates, the synthesis of proteins, and also plays a role in regulating mitochondrial enzymes and energy metabolism, as well as neurological health.<sup>[8]</sup> In a population study of 700 women aged 65 and over, more optimal B12 levels were found to be associated with better mood balance and health.<sup>[17]</sup>

## Biotin<sup>†</sup>

Synthesized by the bacteria in the gut in addition to certain foods,<sup>[18]</sup> biotin and its cofactors are involved in metabolism of fatty acids, amino acids and utilization of B vitamins.<sup>[8]</sup> Biotin has also been found to support healthy blood sugar both in animal<sup>[19]</sup> and human studies. A randomized, double-blind placebo-controlled clinical trial conducted among 70 patients, age 5-25 years old with blood sugar concerns found biotin administration to serve as an adjuvant, which improved sugar management, as well as the balance of blood fats.<sup>[20]</sup>

## Pantothenic Acid<sup>†</sup>

Pantothenic acid and its biologically active derivative, CoA, are essential to the synthesis of fatty acids, membrane phospholipids, amino acids, steroid hormones, and energy production.<sup>[20]</sup> 95% of CoA is found in the mitochondria.<sup>[21]</sup> Pantothenic acid has also been shown to have a balancing effect on blood fats in animal studies<sup>[22]</sup> and has also been shown in the research to support wound healing.<sup>[23]</sup>

## Choline Bitartrate<sup>†</sup>

Though not technically a B vitamin, choline is often associated with B-vitamins. It is important in the construction of cell membranes and plasmalipoproteins, plays a role in cell signaling and in the synthesis of acetylcholine (a neurotransmitter), and is vital for brain development.<sup>[24]</sup> The oxidized form of choline acts as a methyl donor in the methionine cycle.<sup>[25]</sup> In a study of 51 men and women, subjects fed an intentionally choline-deficient diet had greater levels of lymphocyte and DNA damage.<sup>[26]</sup>

## Directions

1 or more capsules per day or as recommended by your health care professional.

## Does Not Contain

Does not contain gluten, corn, yeast, artificial colors and flavors.

## Cautions

If you are pregnant or nursing, consult your physician before taking this product.

<sup>†</sup> 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.



# Supplement Facts<sup>V1</sup>

Serving Size 1 Capsule  
Servings Per Container 60

1 capsule contains	Amount Per Serving	% Daily Value
Thiamin (Vitamin B1) (from Thiamine Hydrochloride USP)	50 mg	3,333%
Riboflavin (Vitamin B2 USP)	50 mg	2,941%
Niacin (as Niacinamide USP)	50 mg	250%
Vitamin B6 (as Pyridoxine Hydrochloride USP)	50 mg	2,500%
Folate (as Quatrefolic® (6S)-5-Methyltetrahydrofolic acid glucosamine salt)	400 mcg	100%
Vitamin B12 (as Methylcobalamin)	500 mcg	8,333%
Biotin	75 mcg	25%
Pantothenic Acid (as d-Calcium Pantothenate USP)	50 mg	500%
Choline Bitartrate	50 mg	*
Inositol NF	50 mg	*

\* Daily Value not established

## References

- 5-methyltetrahydrofolate. *Altern Med Review* 2006; 11(4).
- Rindi G. Thiamin. In: Ziegler E, Filer LJ, eds. Present Knowledge in Nutrition: International Life Sciences Institute; 1996:160-166.
- Thiamine. Monograph. *Altern Med Rev.* Feb 2003;8(1):59-62.
- Alaei Shahmiri F, Soares MJ, Zhao Y, Sherriff J. High-dose thiamine supplementation improves glucose tolerance in hyperglycemic individuals: a randomized, double-blind cross-over trial. *Eur J Nutr.* 2013 Oct;52(7):1821-4. *Epub* 2013 May 29.
- Rivlin R. Riboflavin. In: Ziegler E, Filer LJ, eds. Present Knowledge in Nutrition.: International Life Sciences Institute.; 1996:167-173.
- Lee ES, Corfe BM, Powers HJ. Riboflavin depletion of intestinal cells in vitro leads to impaired energy generation and enhanced oxidative stress. *Eur J Nutr.* 2013 Aug;52(5):1513-21. *Epub* 2012 Nov 6.
- Wilson CP, Ward M, McNulty H, Strain JJ, Trouton TG, Horigan G, Purvis J, Scott JM. Riboflavin offers a targeted strategy for managing hypertension in patients with the MTHFR 677TT genotype: a 4-y follow-up. *Am J Clin Nutr.* 2012 Mar;95(3):766-72. *Epub* 2012 Jan 25.
- Huskinson E, Maggini S, Ruf M. The role of vitamins and minerals in energy metabolism and well-being. *J Int Med Res.* May-Jun 2007;35(3):277-289.
- Sahebkar A. [Epub ahead of print] Effect of niacin on endothelial function: A systematic review and meta-analysis of randomized controlled trials. *Vasc Med.* 2014 Jan 3.
- Mason CM, Doneen AL. Niacin-a critical component to the management of atherosclerosis: contemporary management of dyslipidemia to prevent, reduce, or reverse atherosclerotic cardiovascular disease. *J Cardiovasc Nurs.* 2012 Jul-Aug;27(4):303-16.
- Leklem J. Vitamin B-6. In: Ziegler E, Filer LJ, eds. Present Knowledge in Nutrition: International Life Sciences Institute; 1996:174-183.
- Rimm EB, Willett WC, Hu FB, et al. Folate and vitamin B6 from diet and supplements in relation to risk of coronary heart disease among women. *JAMA.* 1998;279(5):359-364.
- Meydani SN, Ribaya-Mercado JD, Russell RM, Sahyoun N, Morrow FD, Gershoff SN. Vitamin B-6 deficiency impairs interleukin 2 production and lymphocyte proliferation in elderly adults. *Am J Clin Nutr.* 1991;53(5):1275-1280.
- Talbott MC, Miller LT, Kerkvliet NI. Pyridoxine supplementation: effect on lymphocyte responses in elderly persons. *Am J Clin Nutr.* 1987;46(4):659-664.
- Rydlewicz A, Simpson JA, Taylor RJ, Bond CM, Golden MH. The effect of folic acid supplementation on plasma homocysteine in an elderly population. *QJM.* Jan 2002;95(1):27-35.
- Voutilainen S, Rissanen TH, Virtanen J, Lakka TA, Salonen JT. Low dietary folate intake is associated with an excess incidence of acute coronary events: The Kuopio Ischemic Heart Disease Risk Factor Study. *Circulation.* 2001;103(22):2674-2680.
- Penninx BW, Guralnik JM, Ferrucci L, Fried LP, Allen RH, Stabler SP. Vitamin B(12) deficiency and depression in physically disabled older women: epidemiologic evidence from the Women's Health and Aging Study. *Am J Psychiatry.* 2000 May;157(5):715-21.
- Mock DM. Biotin. In: Ziegler E, Filer LJ, eds. Present Knowledge in Nutrition: International Life Sciences Institute; 1996:220-235.
- Sasaki Y, Sone H, Kamiyama S, Shimizu M, Shirakawa H, Kagawa Y, Komai M, Furukawa Y. Administration of biotin prevents the development of insulin resistance in the skeletal muscles of Otsuka Long-Evans Tokushima Fatty rats. *Food Funct.* 2012 Apr;3(4):414-9. *Epub* 2012 Jan 5.
- Hemmati M, Babaei H, Abdolsalehei M. Survey of the effect of biotin on glycemic control and plasma lipid concentrations in type 1 diabetic patients in kermanshah in iran (2008-2009). *Oman Med J.* 2013 May;28(3):195-8.
- Plesofsky-Vig N. Pantothenic Acid. In: Ziegler E, Filer LJ, eds. Present Knowledge in Nutrition: International Life Sciences Institute.; 1996:236-244.
- Naruta E, Buko V. Hypolipidemic effect of pantothenic acid derivatives in mice with hypothalamic obesity induced by aurothioglucose. *Exp Toxicol Pathol.* 2001 Oct;53(5):393-8.
- Ellinger S, Stehle P. Efficacy of vitamin supplementation in situations with wound healing disorders: results from clinical intervention studies. *Curr Opin Clin Nutr Metab Care.* 2009 Nov;12(6):588-95. Review.
- Zeisel SH, Blusztajn JK. Choline and human nutrition. *Annu Rev Nutr.* 1994;14:269-96.
- Hollenbeck CB. An introduction to the nutrition and metabolism of choline. *Cent Nerv Syst Agents Med Chem.* Jun 2012;12(2):100-113.
- da Costa KA, Niculescu MD, Craciunescu CN, Fischer LM, Zeisel SH. Choline deficiency increases lymphocyte apoptosis and DNA damage in humans. *Am J Clin Nutr.* 2006 Jul;84(1):88-94.

† 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.

