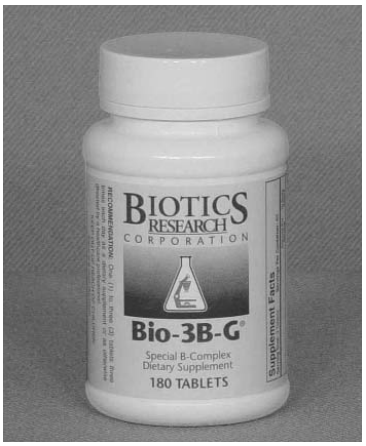
Biotics Research Corporation

Technical Support

Product #1137

Bio-3B-G®

A Versatile B Complex Formulation



Bio-3B-G® *provides three times the RDA of the thiamin and 100% of the RDA of the B vitamin group, including B_2, B_3, B_6 and B_{12}, all in the phosphorylated forms. As such, it is similar in nature to the product* ***Bio-B-100™*** *with the above noted increase in thiamin.*

The Role of the B Complex in Metabolism

The B *complex* refers to a group of water-soluble, organic compounds that are dietary essentials for mammals. The B vitamins are key players in metabolism. As coenzymes they serve as enzyme helpers in central enzymatic pathways that degrade fatty acids, amino acids and glucose to yield ATP, as well as building blocks for cellular machinery. Numerous other enzymes employ the B complex in biosynthetic reactions.

Apoenzymes (proteins without cofactors such as coenzymes) are inactive. Often apoenzymes require coenzymes derived from the B complex. As coenzymes the B vitamins are not converted to energy, but rather they assist the catalytic function of enzymes to produce energy from fuels. Because the B vitamins are water-soluble compounds, they are not stored in the body and therefore, cell function requires the constant availability of all B vitamins. Furthermore, B vitamins need to be supplied in the appropriate ratios to provide balanced enzymatic actions.

Functions of B Vitamins

Each of the B vitamins has a unique metabolic role, thus one B vitamin cannot be substituted for another, and an excess of one will not make up for a deficiency of another. Because B vitamins are required for fundamental functions of organs and tissues, B vitamin deficiencies profoundly affect health. As examples, deficiencies of thiamine, riboflavin, pantothenic acid, folate and vitamin B_{12} impair humoral and cell mediated immunity, as a result of their impact on the function of B cells and T cells. Such deficiencies may also depress delayed skin hypersensitivity and promote thymic atrophy.[1] Additionally, liver detoxification is impaired by deficiencies of riboflavin, vitamin B_6, niacin, folic acid and thiamine.[2]

Niacinamide (Nicotinic acid, a form of vitamin B_3). Niacinamide, in the form of the coenzyme NAD is a required component of oxidation-reduction reactions, which are required for the release of energy from fat, protein and carbohydrate require. As such, the primary function of niacinamide is as part of the coenzymes NAD+ and NADP+. As an example, glycolysis involves the partial anaerobic oxidation of glucose by means of NAD. NAD also functions to funnel electrons into the mitochondrial electron transport chain, to drive ATP synthesis via oxidative phosphorylation.

In the pentose phosphate pathway, which converts glucose to ribose for nucleic acid synthesis, the cofactor pair NADP+/NADPH functions in a reductive manner, while the NAD+/NADH cofactor pair functions in an oxidative manner. Consequently NAD+ and NADP are both required by cells. Niacinamide, rather than niacin, is commonly utilized in nutritional supplements due to the absence of its vasodilating properties, common of niacin.

Thiamine (Vitamin B_1). Thiamine supports the oxidation of fuels in the citric acid cycle (Kreb's cycle). Metabolically, thiamine is converted to cocarboxylase by mucosal cells then is subsequently transferred to the liver. Both increases in energy production and a high caloric intake correlate with a higher daily requirement for B complex vitamins, such as thiamine. Thiamine is also a required component in the decarboxylation of keto acids, and in the pentose phosphate pathway, an alternate pathway for glucose breakdown. Thiamin has also been implicated as an important component in myocardial energy production, calcium homeostasis and the reduction of oxidative stress.[3]

Additionally, thiamine participates in carbohydrate degradation, and is particularly important for the efficient degradation of carbohydrates. The decarboxylation of pyruvate, a key step in carbohydrate metabolism, is thiamine dependent. Consequently, carbohydrate metabolism is first to suffer from thiamine deficiency. Thiamine absorption may potentially be blocked due to folate deficiency, or due to the excess consumption of alcohol.

Pantothenic Acid (Vitamin B_5). Pantothenic acid forms acetyl coenzyme A, the universal carrier of fatty acids employed in fatty acid oxidation, fatty acid and lipid synthesis, and in the oxidation of carbon atoms from fat and glucose, via the citric acid cycle. In addition to functioning in the citric acid cycle, acetyl coenzyme A accepts acetate units from the degradation of certain amino acids. Functionally, Acetyl coenzyme A serves as a building block for cholesterol, steroid hormones, phospholipids, choline and porphyrin hemoglobin. Cell culture studies have associated pantothenic acid with an increased concentration of intra-cellular glutathione.[4]

Riboflavin (Vitamin B_2). This bright yellow vitamin forms two coenzymes, FMN and FAD, which assist oxidations associated with the breakdown of pyruvate and acetate in the citric acid cycle. FAD is also required to transfer electrons in the respiratory chain to generate ATP via oxidative phosphorylation. FAD is a key electron carrier for cytochrome P450, hence riboflavin is an essential component in detoxification reactions. FMN and FAD are also coenzymes for dehydrogenases, which are needed as cofactors for several steps of both glucose and fatty acid metabolism.

Complex I and Complex II of the mitochondrial electron transport chain are the sites of flavoprotein action, requiring riboflavin-derived coenzymes. Optimal performance of NADH-CoQ reductase and Complex I may potentially require extra riboflavin.[5, 6] Prophylaxis for migraine suffers has implicated beneficial results with riboflavin supplementation.[7]

Pyrodoxine (Vitamin B_6). In most cases the first metabolic step for amino acid degradation requires the removal of nitrogen using a set of enzymes called amino transferases (transaminases). These enzymes utilize the coenzyme form of B_6, pyridoxal 5-phosphate, to transfer

BIOTICS® RESEARCH CORPORATION

"The Best of Science and Nature"

amino groups. Following the removal of the amino group, the resulting keto acids are degraded by the citric acid cycle. Alternately, pyridoxal 5-phosphate and transaminases transfer amino acid groups to other keto acids to generate nonessential amino acids, such as alanine, aspartate and glutamate. Vitamin B_6 is also needed for glycogen synthesis, heme synthesis, and the formation of niacin from tryptophan.

Biotin. Biotin is essential for normal glucose metabolism, and in the synthesis of glucose from non-sugar compounds (gluconeogenesis). It is also a functional component of both amino acid and purine metabolism, and is required as a coenzyme in the addition of carbonate to metabolites. Biotin-dependent carboxylation reactions are also involved in the synthesis of fatty acids. Additionally, biotin is necessary liver component in the maintenance of fasting blood sugar levels.

Folic Acid and Vitamin B_{12}

Unlike the B vitamins described above, folic acid and vitamin B_{12} possess specialized functions related to DNA synthesis and cell proliferation.

Folic Acid (folate, folacin). Folate is essential for the formation of red and white blood cells in the bone marrow. This vitamin forms tetrahydrofolate, a coenzyme used to transfer single carbons. Single carbon transfers occur during the synthesis of glycine and serine, and in the formation of guanine, adenine and thymine, which is required for RNA and DNA formation, and is essential to cell division. Additionally, methylation reactions, which occur during the formation of epinephrine, choline, carnitine, histones, and certain amino acids, including N-methylhistidine, rely on folate. Certain bases of RNA and DNA also require methylation, and thus are folate-dependent.

Cobalamin (Vitamin B_{12}). Vitamin B_{12} is the largest and most complex of the B vitamins, of which the activated intermediate is methylcobalamin. It contains cobalt, and represents the only form of this trace mineral essential in the human diet. Vitamin B_{12} is required in fatty acid metabolism and in the transfer of methyl groups for methylation reactions as described above.

Vitamin B_6, vitamin B_{12} and folic acid work together to prevent the accumulation of homocysteine, an independent risk factor for coronary artery disease.[8] In methylation reactions homocysteine is released from the sulfur amino acid methionine following the release of methyl groups. Tetrahydrofolate and vitamin B_{12} can assist in the regeneration of methionine from homocysteine. Alternatively, vitamin B_6 is required to convert homocysteine to cysteine.

The Importance of Phosphorylated B Vitamins

Bio-3B-G® provides biochemically activate forms of the B vitamins, including riboflavin 5-phosphate and cocarboxylase, in lieu of riboflavin and thiamin, respectively. Consequently, fewer enzymatic steps are needed to achieve a fully functional coenzyme. As an example, the first step in the synthesis of NAD is the biochemical conversion of niacin to niacinamide, which then forms nicotinamide mononucleotide, an intermediate for NAD formation.

Riboflavin 5-phosphate is the redox co-enzyme FMN, converted in a single step by flavokinase to FAD, which is more frequently used than FMN. Flavokinase is regulated by thyroxin, and in adults hypothyroidism may be associated with riboflavin deficiency.[9] In addition **Bio-3B-G®** provides two complete coenzymes, pyridoxal 5-phosphate and thiamine pyrophosphate (also known as cocarboxylase).

Activation of vitamin B_6 involves the phosphorylation of pyridoxine (B_6) to pyridoxine phosphate, and its subsequent oxidation to the coenzyme pyridoxal 5-phosphate. Bound to albumin, pyridoxal 5-phosphate characterizes a major storage site and transporter for B_6. In the serum of healthy persons, Pyridoxal 5-phosphate comprises between 25% and 60% of the circulating levels of vitamin B_6.[10] The liver is the primary site of pyridoxal 5-phosphate formation. Thus it is not surprising that up to 90% of people with cirrhotic liver are deficient in vitamin B_6.[10]

Due to the fact that **Bio-3B-G®** supplies three times the amount of thiamine ("B factor") in the form of thiamine pyrophosphate and 100% RDA of the B vitamin group, including B_2, B_3, B_6 and B_{12}, it may be a beneficial adjunct in nutritionally supporting normal homoeostatic mechanisms, particularly during stress and/or with elevated blood pressure.

Supplement Facts

Serving Size: 3 Tablets — **Servings Per Container: 60**

	Amount Per Serving	% Daily Value
Thiamin (B_1)(as cocarboxylase)	4.5 mg	300%
Riboflavin (B_2)(as riboflavin-5-phosphate)	1.7 mg	100%
Niacin (as niacinamide)	20 mg	100%
Vitamin B_6 (as pyridoxal-5-phosphate)	2 mg	100%
Folate (as folic acid)	400 mcg	100%
Vitamin B_{12} (as resin bound cobalamin)	6 mcg	100%
Biotin	300 mcg	100%
Pantothenic Acid (as calcium pantothenate)	10 mg	100%
Superoxide Dismutase (from vegetable culture †)	60 mcg	*
Catalase (from vegetable culture †)	60 mcg	*

***Daily Value not established**

Other ingredients: Vegetable culture † (specially grown, biologically active containing naturally associated and/or organically bound phytochemicals including polyphenolic compounds with SOD and catalase, dehydrated at low temperature to preserve associated enzyme factors), cellulose, stearic acid (vegetable source), magnesium stearate (vegetable source) and food glaze.

RECOMMENDATION: One (1) to three (3) tablets three (3) times each day as a dietary supplement or as otherwise recommended by a healthcare professional.

KEEP OUT OF REACH OF CHILDREN
Store in a cool, dry area.
Sealed with an imprinted safety seal for your protection.

NDC #55146-01137 Rev. 1/08

References

1. Soumshaw NS, SanGiovanni JB. Synergy of nutrition, infection and immunity: an overview. Am J Clin Nutr 1997;66: 4645-4775.

2 Guengerich FP. Influence of nutrients and other dietary materials on cytochrome P-450 enzymes. Am J Clin Nutr 1995; 61 (Suppl): 651s-658s.

3 Allard ML, Jeejeebhoy KN, Sole MJ. The management of conditioned nutritional requirements in heart failure. Heart Fail Rev. 2006 Mar;11(1):75-82.

4 Slyshenkov VS et al. Pantothenic acid and its derivatives protect Ehrlich ascites tumor cells against lipid peroxidation. Free Radic Biol Med 1995; 19(6): 767-772.

5 Arts WFM et al. NADH-CoQ reductase deficiency myopathy; successful treatment with riboflavin. Lancet 1983; 2:581-2.

6 Scholte HR et al. Riboflavin-Responsive complex I deficiency. Biochim Biophys Acta 1995; 1271:75-83.

7 Schoenen J et al. Effectiveness of high-dose riboflavin in migraine prophylaxis. Neurobiology. 1998; 5:466-70.

8 Frolich JJ. Lipoproteins and homocysteine as risk factors for arteriosclerosis: assessment and treatment. Can J Cardiol 1995; 11: 18C-23C.

9 Cimino JA et al. Riboflavin metabolism in the hypothyroid human adult. Proc Soc Exp Biol Med 1987; 184: 151-153.

10 Lumeng L, etal. Plasma content of B6 vitamins and its relationship to hepatitis vitain B_6 metabolism. J Clin Invest 980; :688-95.

Product Information

Bio-3B-G® is supplied as 180 tablets per bottle.

Product Adjuncts: **Cytozyme-PT\HPT™** and **ADHS®**

For additional information contact:
Biotics Research Corporation
6801 Biotics Research Drive
Rosenberg TX 77471
Phone: (281) 344 - 0909
Toll Free: (800) 231 - 5777
Fax: (281) 344 - 0725

Website: www.bioticsresearch.com
Email: biotics@bioticsresearch.com

BIOTICS® RESEARCH CORPORATION

"The Best of Science and Nature"