

Nutrient Profile of **EMPOWERPLUS[®]**

Nutritional Support for CNS Disorders



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Preface

There are many good reasons to suspect that nutrition, or the lack of it, may be the root cause of many of our chronic illnesses, including disorders of the central nervous system. Small population pockets in a few places around the world such as the Hunza population in Kashmir, the Georgians from the southern Soviet Union and the mountain village of Vilcabamba in Ecuador are reported to live much longer and remain more vigorous in old age than in most modern societies.¹ The Japanese island of Okinawa also shares a similar reputation, and like these other populations enjoys life with little or no chronic or mental illness. One has to ask why such a phenomenon occurs. The only common factor shared by these diverse populations seems to be the incredible macro and micronutrient density of their foods and water coupled with rich soils, which do not suffer from depletion. These populations ingest many times the macro and microelement levels ingested by the average North American.

Around the world, soil depletion of nutrients is at a very high level. The statistics from the 1992 Earth Summit Report indicate that 85% of the minerals present in North American topsoils 100 years ago are no longer present. This correlates with the findings of Anne-Marie Mayer, PhD who reported that the general decline of nutrients in 40 foods examined over a 50-year period of analysis in the UK reached a peak of an 81% decrease for a single element.² This decrease in nutrient density in our foods could easily have been predicted; as for hundreds of years the principle elements replenished in farm soils have been only nitrogen, phosphorus and potassium. The over-processing of foods has also, no doubt, contributed to the problem of low nutrient intake. White flour, for instance, contains only 7% of the trace elements found in whole-wheat flour.³

Another factor which figures into this equation is the load put on body resources to metabolize and eliminate environmental contaminants and pollutants. Various chemicals including herbicide and pesticide exposure, not to mention the numerous airborne toxins that our bodies are constantly exposed to, put an overload on body metabolic processes and resources to counter such exposure.

1. Nutrient Insufficiency Theory

Conventional small talk about the need for dietary supplements often brings forth the statement that our foods contain all the nutrients we require when we ensure a variety in our diet. Though such may have been the case in the past, science will no longer support such a concept. According to USDA recommended Dietary Guidelines for Americans, only 25% of the overall population met the recommended calcium intake in 1994-96 and only 6% of female adults over 60 met the recommended intake of calcium. Only 59% of the US population⁴ met the recommended daily iron intake for the same period. Of even greater concern is the fact that the percentage of children meeting that intake level was exactly the same as the general population. A majority of Americans consume less than the minimum suggested copper intake, which is only 1.5 milligrams per day. In addition to these statistics, even low limits of daily intake set as RDA requirements were not met by the population in general for Vitamin E, Vitamin B6, magnesium or zinc to mention only a few of many which could be cited.

One has but to examine the complex metabolic pathways in simple amino acid metabolism in the body to realize that deficiency of even a single element has the potential to wreak havoc with the complex central nervous system. Each of the hundreds of enzymes involved in these complex pathways has a base of one of the essential elements of life, which, as already established, may very well be lacking in our diets.

Every central nervous system disorder has been correlated with the levels of various essential nutrients in tissues of those who suffer from the disorder. Such studies show statistically significantly lower levels of these elements as compared to a normal control population. Usage of several such elements to mitigate the effects of CNS disorders is well documented in the literature. In modern time, studies of this nature, dating back to as early as 1929, report several successful trials using the element manganese alone to alleviate some of the symptoms of schizophrenia. Such literature is best summarized in Dr. Melvyn R. Werback's book "Nutritional Influences on Mental Illness" – a sourcebook of clinical research.⁵ He includes over 450 pages of references from hundreds of review articles, case reports, observational studies and various types of randomized controlled trials (with single, double blind, and cross-over designs) demonstrating efficacy with numerous elements which have shown significant mitigating effects on symptoms of virtually every CNS disorder.

The postulation that mental illness could be the result of something as simple as nutrient insufficiency does not seem so outlandish after examining the evidence. In fact such a theory would indeed explain most of what is seen in mental illness. For instance, if mental illness is the result of deficiency, then one would expect to see a higher rate of mental illness in those who experience uptake problems related to bowel dysfunction. The reality of this is evidenced in an article printed in the Jan.8, 1999 issue of General Hospital Psychiatry. According to these researchers at John Radcliffe Hospital in Oxford, England, 90% of the patients who repeatedly sought treatment for digestive tract symptoms but showed no evidence of organic disorder had at least one current psychiatric diagnosis - 48% had at least two.⁶ Postpartum-initiated mental illness and premenstrual syndrome are also explained by the depletion of nutrients during these conditions. In fact, numerous situations that create a drain on the body's mineral reserves seem to serve as a trigger point for mental illness. These would include: accidents, surgery, situational stress and many other forms of trauma.

One aspect of the literature that appears to have been overlooked (possibly due to the scientific procedure of investigating only one variable at a time) is the probability that many identifiable single-element deficiencies may be combining into multiple deficiencies accompanied by more complex symptomatology. Such multiple-deficiencies would only respond to a broad-spectrum nutritional supplement set to address virtually every insufficiency that may play a role in symptoms. Thus one would both predict and expect the significant positive response seen in a broad range of psychiatric symptoms upon supplementing the very complex, highly bio-available, well-balanced supplement we call **EMPowerplus**.

2. Nutrient Profile

2.1 An Introduction to EMPowerplus

EMPowerplus is an acronym, which stands for **Essential Mineral Power Plus**. The supplement was developed over a five-year period following extensive research with individuals suffering with CNS disorders. Through a process of trial and error the product was assembled using a multivariate nutrient base. A modulation in mineral and vitamin levels was undertaken until maximum performance of the supplement was obtained by noting a symptoms decrease in the participants using the nutrient protocol.

EMPowerplus provides a complete and balanced nutrient program covering multiple deficiencies in numerous areas of the body including the Central Nervous System. The composite contains thirteen vitamins, three amino acids, and seventeen minerals in a highly bio-available form. Increased bio-availability allows the body to utilize a higher percentage of the mineral content making more nutrients available for the body processes. It is important to understand that minerals are involved in the human production of DNA, RNA, hormones and neurotransmitters.

2.1.1 Relationships between Nutrient deficiencies and CNS disorders

The late Linus Pauling of the Linus Pauling Heart Institute, winner of two Nobel prizes (one in medicine) indicated “you can trace every sickness, every disease, and every ailment to a mineral deficiency”. Over 40% of the U.S. population is taking a vitamin – mineral supplement in the hopes of finding some health benefit.⁷

Much research has been completed demonstrating the importance of minerals in body function and that individuals suffering with the Central Nervous System (CNS) disorders of **ADHD, Schizophrenia, Bi-polar Disorder, Clinical Depression, Autism, Anorexia Nervosa & Dementia** demonstrate significantly lower levels of micro and macro elements in hair, plasma, cell, urine and tissue analysis.

ADHD

The magnesium, zinc, copper, iron and calcium level of plasma, erythrocytes, urine and hair in 50 children aged 4 to 13 years with hyperactivity, were examined by AAS. The average concentration of all trace elements was lower when compared with the control group.⁸

Schizophrenia

23 hair trace elements were determined with the method of Inductively Coupled Plasma Quantometer (ICP-AEP) in 85 cases of schizophrenics and 65 cases of normal controls. As a whole, 17 trace elements were decreased in schizophrenics than normal controls, the differences were significant (P less than 0.01).⁹

Affective Disorders

The concentrations of a number of elements were determined in the plasma and erythrocytes of 21 Nigerians (11 females, 10 males) with symptomatic affective disorders. (11 depressives, 10 manics) and in 40 normal controls using proton – induced X-ray emission (PIXE) analysis. The plasma and erythrocyte Cu, and erythrocyte P, Ca, Fe, and Zn were significantly lower in the patients compared to the controls.¹⁰

Clinical Depression

This study investigates serum levels of zinc in 48 uni-polar depressed subjects (16 minor, 14 simple major and 18 melancholic subjects) and 32 normal volunteers. Serum zinc levels were significantly lower in major depressed subjects than in normal controls.¹¹

Autism

“The concentrations of 14 elements were determined in scalp hair samples from hair samples from control, autistic and autistic – like children. Significant differences were noted between normal males and females for calcium, magnesium and mercury. The autistic population had significantly lower levels of calcium, magnesium, copper, manganese and chromium...”¹²

Anorexia Nervosa

“In this study, the zinc status was evaluated in 62 patients with bulimia and 24 patients with anorexia nervosa. Forty percent of patients with bulimia and 54% of those with anorexia nervosa had biochemical evidence of zinc deficiency.”¹³

Dementia

“A significant decrease in both Ca and P in CSF (Cerebral Spinal Fluid) was observed in Alzheimer’s type dementia (p less than 0.01) and multi-infract dementia cases (p less than 0.01). The geriatric controls also showed a significant decrease in both Ca and P. A 60% decrease in diffusible Ca in CSF was noted both in patients and geriatric controls when compared to adult controls (p less than 0.05). The significant decrease in CSF Ca and P in both groups of patients compared with age matched controls suggests this lowering of Ca and P is not due to solely to the aging process and indicates a role in the pathology of age – related disorders.”¹⁴

2.2 Ingredient List – EMPowerplus Capsules

Supplement Facts		EMPOWERPLUS®	
Serving Size: 4 capsules			
Servings Per Container: 57			
	Amount Per Serving	% DV	
Vitamin A (retinyl palmitate)	1536 IU	30%	
Vitamin C (ascorbic acid)	160 mg	270%	
Vitamin D (cholecalciferol)	384 IU	100%	
Vitamin E (d-alpha tocopheryl succinate)	96 IU	320%	
Vitamin B1 (thiamine mononitrate)	4.8 mg	320%	
Vitamin B2 (riboflavin)	3.6 mg	210%	
Vitamin B3 (niacinamide)	24 mg	120%	
Vitamin B5 (d-calcium pantothenate)	5.8 mg	60%	
Vitamin B6 (pyridoxine hydrochloride)	9.6 mg	480%	
Vitamin B9 (folic acid)	384 µg	100%	
Vitamin B12 (cyanocobalamin)	240 µg	4000%	
Vitamin H (biotin)	288 µg	100%	
Calcium	352 mg	35%	
Phosphorous	224 mg	20%	
Magnesium	160 mg	40%	
Potassium	64 mg	2%	
Iodine (from Pacific Kelp)	54.4 µg	35%	
Zinc	12.8 mg	90%	
Selenium	54.4 µg	80%	
Copper	1.9 mg	100%	
Manganese	2.6 mg	130%	
Chromium	166.4 µg	140%	
Molybdenum	38.4 µg	50%	
Iron	3.7 mg	20%	
Proprietary Blend	444.1 mg	*	
dl-phenylalanine, glutamine, citrus bioflavonoids, grape seed extract, choline bitartrate, inositol, ginkgo biloba, methionine, germanium sesquioxide, boron, vanadium, nickel			
* Percent Daily Values (%DV) are not established			
Other Ingredients: gelatin, silicon, magnesium stearate			

2.3 Ingredient List – EMPowerplus Powdered Drink Mix

Supplement Facts		EMPOWERPLUS® Powder	
Serving Size: 1 scoop (1 tbsp)(16.5g)		1 scoop equals 4 capsules	
Servings Per Container: 60			
	Amount Per Serving	% DV	
Calories	50		
Total Fat	1.5 g	2%	
Calories from Fat	10		
Total Carbohydrates	5 g	2%	
Sugars	3 g	*	
Protein	5 g	10%	
Vitamin A (betacarotene, retinyl palmitate)	1440 IU	28%	
Vitamin C (ascorbic acid)	150 mg	250%	
Vitamin D (cholecalciferol)	360 IU	90%	
Vitamin E (d-alpha tocopheryl succinate)	90 IU	300%	
Vitamin B1 (thiamine mononitrate)	4.5 mg	300%	
Vitamin B2 (riboflavin)	3.4 mg	200%	
Vitamin B3 (niacinamide)	22.5 mg	112%	
Vitamin B5 (d-calcium pantothenate)	5.4 mg	54%	
Vitamin B6 (pyridoxine hydrochloride)	9 mg	450%	
Vitamin B9 (folic acid)	360 µg	90%	
Vitamin B12 (cyanocobalamin)	225 µg	3750%	
Vitamin H (biotin)	270 µg	90%	
Calcium	330 mg	33%	
Phosphorous	210 mg	21%	
Magnesium	150 mg	37%	
Potassium	60 mg	2%	
Iodine (from Pacific Kelp)	51 µg	34%	
Zinc	12 mg	80%	
Selenium	51 µg	73%	
Copper	1.8 mg	90%	
Manganese	2.4 mg	120%	
Chromium	156 µg	130%	
Molybdenum	36 µg	48%	
Iron	3.4 mg	19%	
Proprietary Blend	850 mg	*	
choline bitartrate, dl-phenylalanine, citrus bioflavonoids complex, glutamine, inositol, methionine, boron citrate, grape seed extract, ginkgo biloba leaf extract, germanium sesquioxide, vanadium, nickel sulfate.			
* Percent Daily Values (%DV) are not established			
Other Ingredients: whey protein (Milk), fructose, sunflower oil, milk protein, instant non fat dry milk, acacia gum, natural flavors (banana, orange) guar gum, glycine, xanthin gum, silicon dioxide, citric acid, stevia, magna sweet.			

2.4 Detailed Analysis of EMPowerplus Including Toxicity

In this section we will explore each nutrient found in EMPowerplus and provide some of the functional and toxicity research that relates to it, and also its effect on neurochemistry.

Vitamin A

The nutritionally active form of Vitamin A is Retinol. Vitamin A is converted into Retinol and mainly stored in the liver. Of all of the sources of Vitamin A, beta-carotene is the most available and also the form that yields the highest amount of Vitamin A. There are many functions performed by Vitamin A, including promoting cellular growth and healing. Vitamin A has a variety of uses in basic tissue and health maintenance, in clinical treatment for a number of problems (some of which may be Vitamin A deficiency symptoms), and in the prevention of many illnesses and diseases. Vitamin A works better when there are sufficient body levels of zinc and an adequate intake of protein.

Beta-carotene may help protect the elderly from mental impairments. Research found that in a population of males and females from 55-95 years old, increased beta-carotene intake was associated with improved mental abilities.¹⁵

In a placebo controlled study involving 218 patients with PMS, expressed as headache, agitation, irritation, depression and fatigue, patients received 200,000 –300,000 I.U. of Vitamin A daily. 48% of the patients experienced complete symptom relief, 41.2% had a partial effect, and 10.8 failed to improve.¹⁶

100 female patients were administered Vitamin A at 50,000 I.U. twice per day (100,000 I.U. total/day) during the second half of their cycles with favorable results.¹⁷

Another PMS study conducted with 30 patients using 200,000 I.U./day of Vitamin A was administered for a period of 2-6 months. The majority of the patients considerably improved. It was noted that the symptoms did not reoccur in the year following cessation of the vitamin therapy.¹⁸

Vitamin A plasma level was reduced in depressive patients. In a study involving 202 healthy controls and 58 depressive patients, the depressive patients showed a significant decrease in serum Vitamin A levels when compared to the healthy controls.¹⁹

Toxicity: Numerous studies have shown that Vitamin A is safe and has a low level of toxicity. “Approximately 10 to 15 cases of Vitamin A toxic reactions are reported per year in the United States, usually at doses greater than 100,000 IU/d. No adverse effects have been reported for beta-carotene.”²⁰ A study presented in 1996 in the Archives of Internal Medicine (an American Medical Association Journal) indicated “The mean time to intoxication is estimated to be 7 1/2 months at doses of 300,000 IU/d and 3 1/2 months for 500,000 IU/d for 70-kg person”.²¹ There are studies using beta-carotene doses as high as 300,000 IU/d for over 15 years providing evidence of no adverse effects.²²

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 5,760 IU.

Vitamin B1 (Thiamine or Thiamin)

B1 provides support to the nervous system and mental function. It plays a role in the production of acetylcholine, an important neurotransmitter. Acetylcholine functions at the synaptic junctions of neurons.

It was discovered that thiamine deficiency plays a major negative role in the CNS disorder of anorexia nervosa.²³

Thiamine has been used to successfully treat alcohol-dependent people with memory function problems suffering with Wernicke-Korsakoff Syndrome (WKS). Treatment with thiamine has been shown to rapidly resolve acute symptoms of the disorder.²⁴

“In the years 1994-1997, 9 patients with no history of alcohol abuse presented with acute signs of ophthalmoplegia or nystagmus and ataxia which resolved within 48 h after intravenous thiamine”.²⁵

In a study of 20 patients involving biochemical evidence of thiamine deficiency related to “junk” food diets, especially the adolescents, were impulsive, highly irritable, aggressive, sensitive to criticism, and angered easily.²⁶

Anxiety may be associated with a B vitamin deficiency. In 12 agoraphobic patients 7 were found to be deficient in thiamine, 6 in pyridoxine, 3 in niacin and 3 in vitamin B12.²⁷

Toxicity: There is no stated toxic level for Vitamin B1. Consumers have taken hundreds of milligrams per day with no reported toxic reactions.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 18 mg.

Vitamin B2 (Riboflavin)

Riboflavin acts as precursor or building block for coenzymes that relate to body energy production. It is also important in cell respiration and oxygenation. Symptoms of a deficiency in riboflavin can include dizziness, fatigue, retarded growth in children and nerve tissue damage.

A recent study completed at King’s College School of Medicine, London, U.K. demonstrated that Vitamin B2 deficiency may be involved in fibromyalgia.²⁸

In a study involving anorexic adolescent females compared to healthy adolescent females, the anorexic patients showed lower levels of erythrocyte and plasma riboflavin and riboflavin cofactors.²⁹

In dementia research, deficiency of riboflavin was associated with forgetfulness, inability to concentrate and mild confusion.³⁰

Toxicity: An extensive literature review did not reveal any studies demonstrating toxic reactions to the use of riboflavin. Deficiency appears to be of greater concern rather than toxicity. Many vitamin B supplements offer riboflavin at 100mg/day.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 13.5 mg.

Vitamin B3 (Niacin)

Niacin has been proven to be very beneficial in the treatment of CNS Disorders. It is a precursor to the production of the coenzymes NAD (nicotinamide adenine dinucleotide) and NADP (nicotinamide adenine dinucleotide phosphate). These two coenzymes are important factors in brain metabolism and brain function. Deficiency in niacin and in niacin production results in decreased production of NAD and NADP.³¹ This results in metabolic deviations dependent on NAD and NADP, insufficient mitochondrial activity,³² resulting in a reduction of MAO (Monoamine Oxidase) production and followed by inhibition of oxidative deamination of the biogenic amines, tryptamine, serotonin, ect., and dimethylated amines.^{33 34} Niacin is also a factor in the body production of the hormones such as estrogen, progesterone, and testosterone, as well as other corticosteroids. In human research, niacin has been proven to prevent breakage of DNA strands.³⁵

Deficiency in Niacin may cause emotional lability and irritability.³⁶

ADHD is positively affected in a double blind study involving 33 children using niacin and ascorbic acid vs. a placebo. The majority of the patients suffered with disturbed and disturbing behavior. Only 1 out of the 33 children failed to respond positively, and all relapsed within thirty days of cessation of the supplement program.³⁷

Toxicity: Like the other B vitamins there seems to be no toxic dose. Upper levels of niacin may cause a “niacin flush”, a harmless reaction which may produce some discomfort for the user. Niacin has been used in orthomolecular psychiatry in doses up to 6000 mg/day.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 90 mg.

Vitamin B5 (Pantothenic Acid)

Pantothenic acid, an antipellegra vitamin³⁸, is part of all living cells. It plays important roles in various metabolic processes, especially fatty acid synthesis and degradation. It functions as Coenzyme A, which supports adrenal gland function to produce cortisone and other adrenal hormones such as norepinephrine. It is known as the anti-stress Vitamin And assists greatly in alleviating fatigue. B5 has been shown to have a significant effect on human health, in combating disease.³⁹

A study completed in an Iowa State Prison showed that deficiencies in pantothenic acid cause irritability.⁴⁰ Male volunteers were provided a diet adequate except for pantothenic acid. The men became quarrelsome, hot tempered, and were easily upset. They also developed low blood pressure, dizziness, extreme fatigue, muscle weakness, sleepiness, stomach distress, constipation, rapid pulse on exertion and upper respiratory problems.

Fatigue is also cited as an issue of deficiency in vitamin B5. 10 healthy men were placed on a diet restrictive in vitamin B5. Five of them as well were supplemented with vitamin B5 at 10 mg./day. After 63 days the deprived men were listless and suffered with fatigue.⁴¹

Toxicity: Once again, being part of the B vitamin family, there seems to be no toxic effects presented from relatively large doses. Doses of 1000mg/day have been used for over six months with no ill effects.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 21.6 mg.

Vitamin B6 (Pyridoxine)

Pyridoxine is a very important B vitamin expressing itself as the coenzyme Pyridoxal –5-phosphate. It functions in amino acid metabolism in the central nervous system. It is responsible for the production of an important neurotransmitter, GABA (gamma – aminobutyric acid). GABA assists in the conversion of the amino acid tryptophan to niacin in the tryptophan pathway. A failure in the tryptophan pathway production of niacin creates a spillover in the serotonin pathway, resulting in an excess production of serotonin, the hallucinogen bufotin and DMT (di-methyl tryptamine).⁴² It is thought that this may account for the symptom of psychosis in disorders such as schizophrenia. Vitamin B6 also plays a key role in the synthesis of several other neurotransmitters, including dopamine and norepinephrine.⁴³ These neurotransmitters are significant for human mood and emotional control.

Recent research from the Department of Pediatrics, Keio University School of Medicine, Tokyo, Japan demonstrated that Vitamin B6 plays an integral part in the CNS as a natural anticonvulsant.⁴⁴

Deficiency of Vitamin B6 has been proven to cause irritability in volunteers receiving a vitamin B6 deficient diet and a pyridoxine antagonist. The participants became irritable and depressed.⁴⁵

Anxiety may be caused by deficiency of Vitamin B6. A clinical trial involving 1081 men ages 17-29. Those found to be depleted of B6 (based on erythrocyte activity) were significantly more anxious on the Freiburg Personality Inventory.⁴⁶

Double blind autistic study. 52 Children with autism and 11 controls (normal) were treated with Vitamin B6 and magnesium. The treatment combining both ingredients was the most effective in reducing in autistic behavior.⁴⁷

Toxicity: Toxicity is not a major issue with Vitamin B6. There are no reports of toxic effects using Vitamin B6. Daily doses of 150-200mg. are not uncommon.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 36 mg.

Vitamin B12 (Cyanocobalamin)

Cyanocobalamin is a vitamin that contains the mineral cobalt. B12 has been shown to be essential in the metabolism of nerve tissue and necessary for the operation and health of the central nervous system. B12 deficiency can be “characterized by feeding difficulties, failure to thrive, hypotonia, seizures, microcephaly and developmental delay...often with early death and significant neurological impairment in survivors.”⁴⁸ Other symptoms of deficiency include fatigue, mental slowness, tingling, and numerous other psychological and nerve symptoms. Cobalamin also functions in the synthesis of RNA and DNA and is absolutely essential to proper CNS function.

An interesting case was recently published involving an 11-year-old boy presenting with severe sub-acute sensory ataxia, unusual skin hyper-pigmentation, megaloblastic anemia, low serum B12 levels. He was diagnosed with pernicious anemia. A spinal MRI demonstrated extensive demyelination of the posterior columns along the entire length of the spinal cord. "Treatment with cobalamin produced complete remission of the neurologic deficits and normalization of the MRI findings in the short space of 2 months. Although rare, childhood pernicious anemia is a treatable disease that should be included in the differential diagnosis of the sensory ataxias in children."⁴⁹

Another case study published recently involved a "twenty-one-year-old female known to suffer from bipolar type I disorder [who] developed features of a pseudodementia. Following prompt initial response to treatment with antidepressants, there was an early recurrence of cognitive impairment. Blood investigations confirmed a macrocytic anaemia and vitamin B12 with folate deficiencies. There was dramatic resolution of cognitive impairment after vitamin replacement."⁵⁰

The following demonstrates the results of an observational study on deficiency of Vitamin B12 in those exhibiting anxiety. In that study of young males cobalamin levels were determined using repeated plasma measures. Those patients found to be seriously deficient in cobalamin were also significantly more anxious on the Adjective Check List.⁵¹

In a hospitalized observational study Serum B12 was measured in every patient over 30 years old. It was estimated that the percentage of hospitalized patients with a B12 deficit was 30 times higher than the general population for that area.⁵²

Deficiency of B12 relates to depression, confusion, mental slowness and memory deficits. In a study of 25 patients it was shown that in all cases but two, response to B12 supplementation was significant.⁵³

Toxicity: Vitamin B12 has been used in doses of 750-1000 mcg/day safely for fatigue therapy. There are no reports of toxic effects from the use of B12 even with much larger doses.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 900 mcg.

Vitamin C

Vitamin C has been proven to have a beneficial affect on cellular health. Studies have shown that vitamin C is used by approximately 35% of the US population.⁵⁴ Linus Pauling, winner of two Nobel prizes (one in medicine), indicated that optimum levels of vitamin C are between 2,500 and 10,000 mg per day. The scurvy that took so many lives in the immigration of settlers to North America in early 1600-1800s was arrested by the vitamin C found in fresh fruits and vegetables.

It appears that vitamin C deficiency may have a role in mental disorders. Plasma vitamin C concentrations in psychiatric patients were measured in 885 patients in a psychiatric hospital and in 110 healthy controls. The average value of vitamin C was lower in the patients (0.51 mg/100 ml) than in the controls (0.87 mg/100 ml).⁵⁵

A double blind study involving 45 delinquent boys aged 16-18 at the Beaumont, Virginia School for boys was undertaken. The treatment group was administered 1 gram each of vitamin C and Niacin for a 6-week period. After the 6-week period the active group showed significant improvement while the placebo group showed minor improvement.⁵⁶

Nervousness may be associated with deficiency in vitamin C. Based on repeated testing for plasma ascorbic acid levels, those found to be chronically deficient in vitamin C also demonstrated significant symptom levels on the Adjective check list.⁵⁷

In vitamin C research it was established that depression is the first clinical symptom of scurvy or vitamin C deficiency in humans.⁵⁸

Toxicity: Toxicity of vitamin C is not an issue, given that there are so few case reports of adverse reactions (U.S. statistics) in a population where vitamin C is used so commonly.^{59 60} Vitamin C tablets are commonly produced in 500 mg and 1000 mg sizes.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 600 mg.

Vitamin D (Cholecalciferol)

Vitamin D acts as an important co-factor in the uptake and absorption of calcium and phosphorus. Calcium and phosphorus are essential to CNS function. Vitamin D has been proven to be effective in the treatment of rickets. Common sources of D vitamins are the fish oils, liver and eggs.

Calciferol (D2) when combined with calcium has been shown in research studies to arrest the symptoms of asthma. It was concluded that calcium, given orally in combination with calciferol (vitamin D2), causes a decrease of airway obstruction in patients with allergic bronchial asthma.⁶¹

Toxicity: In January of 1937 a nine-year study was presented with 64 dogs and 773 humans. In the humans, vitamin D "doses routinely given ranged upward from 200,000 I.U. total daily dose for periods ranging from 7 days to 5 years. Both human subjects and dogs generally survived the administration of 20,000 I.U. per kilogram (14,5545,000 I.U. for 160 pound man) per day for indefinite period without intoxication."⁶²

Other human studies using extreme doses of vitamin D were published in medical journals demonstrating safety. " During four three-day periods, vitamin D was given beginning with a dose of 200,000 I.U. per day. This was increased by 200,000 I.U. during each of the two succeeding three-day periods. During the last period, each patient received 1,000,000 I.U. per day. None of the patients showed signs of toxicity. During the last three days there ensued an increase in appetite and the patients had less discomfort. There was neither loss of weight nor marked change in the clinical picture. The blood pressure remained normal."⁶³

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 1,440 IU.

Vitamin E (Tocopherol)

Vitamin E acts as an anti-oxidant, protecting DNA, cell membranes, and enzymes from free radical damage. It has a major role in cellular health.

Research showed favorable results have been seen by patients with tardive dyskinesia using a supplement of vitamin E.⁶⁴

Toxicity: In an extensive review of available animal and human data, Bendich and colleagues concluded that vitamin E supplementation resulted in few adverse effects, even at doses as high as 3200 mg/day.⁶⁵ Numerous studies have been also completed using high doses of vitamin E.^{66 67 68 69 70 71}

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 360 IU.

Vitamin B9 (Folic acid)

Folic acid is another B vitamin, and functions as a coenzyme, THFA (tetrahydrofolic acid). Folate is commonly found in green leafy vegetables. Deficiency of folic acid is very common and in many cases accounts for low birth weight babies. THFA is very important to the breakdown and use of protein. It also plays a major role in the division of cells in the body. "Folic acid plays a critical role in the prevention of chromosome breakage and hypomethylation of DNA."⁷²

A folate deficiency can present symptoms of cognitive impairment.⁷³

It has been proposed that the application of folic acid in Parkinson's Disease showed promise in replacing the current therapy of L-dopa.⁷⁴

Folic acid deficiency in Bipolar disorder is not uncommon. 45 hospitalized bipolar patients were found to have a red blood cell folate level of 193 nmol/litre compared to the normal control group with red blood cell folate level of 896 nmol/litre.⁷⁵

Folate deficiency may relate to Chronic Fatigue issues. In research based on established norms 50% of a group of 60 CSF patients had deficient serum folate levels.⁷⁶

Toxicity: As with the other B vitamins, there are no specific toxic reactions excessive folate intake documented in medical literature. Deficiency is found to be of much greater concern for health. There are studies using doses of folate as high as 60mg per day.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 1,440 mcg.

Vitamin H (Biotin)

Biotin plays a role through the biotin coenzyme in metabolizing fats. It aids in the synthesis of fatty acids, RNA and DNA. A 1998 animal study showed a decrease in white blood cell function with biotin deficiency.⁷⁷

Biotin supplements may help to improve blood glucose control in diabetics by enhancing insulin sensitivity and increasing the activity of enzymes involved in glucose metabolism.⁷⁸

Biotin in high doses may also be useful in the treatment of diabetic neuropathy.⁷⁹

Biotin has also been used to treat metabolic abnormalities in sufferers of Duchenne muscular dystrophy.⁸⁰

A study was hosted wherein 4 normal subjects were feed a diet only deficient in biotin for 10 weeks. Symptoms of depression, lethargy, anorexia and fatigue were created in the patients. All sign and symptoms were then alleviated with supplementation of biotin.⁸¹

Toxicity: As with B vitamins, toxicity does not seem to be a problem. Most vitamin H supplements contain about 300-400 mcg/day.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 1,080 mcg.

Calcium

Calcium, one of the most abundant minerals found in the body, plays a major role in CNS function. Calcium is of great importance for all types of muscle function, including regulation of the heartbeat.

Calcium is seen as a major factor in neurotransmission and is required in the synaptic discharge of neurotransmitters. Increased intracellular levels of calcium promote fusion of synaptic vesicles within the axon membrane of the neuron, thereby assisting in neurotransmission within the CNS.⁸² Calcium is essential for nerve impulse conduction and activates some enzymes, which generate neurotransmitters.

Production of norepinephrine and serotonin are also affected by CNS calcium levels.

A recent double-blind, placebo-controlled study carried out at Brown University School of Medicine evaluated the effect of calcium on PMS (premenstrual syndrome). The study involved 466 women with PMS; calcium was effective in reducing emotional, behavioral, and physical premenstrual symptoms.⁸³

A study with hyperactive children compared to normal controls showed a significant calcium deficiency in calcium levels in hair, urine, erythrocytes and plasma. Results suggest that calcium supplementation is required in children suffering with ADHD.⁸⁴

A case report of 4 autistic children who hit or poked their eyes experienced hypocalciuria. 3 of the 4 patients ceased with the self injury when administered a calcium supplement.⁸⁵

Plasma calcium was found to be lower in observational study between 11 bipolar patients and 10 healthy controls.⁸⁶

Serum levels of calcium were reduced significantly in 22 women with senile dementia compared to age matched controls.⁸⁷

It has been shown that Vitamin D and C are required in the body uptake of calcium.

Toxicity: Toxic effects from intake of calcium are rare, as the body can excrete excess. Doses up to 2,500 mg/day are generally considered safe. Deficiency is an issue, especially among women where osteoporosis, a calcium-related bone disorder, afflicts a major percentage of women over seventy years of age. A study involving women in France found that women supplementing with 1200 mg/day of calcium and 800 I.U. Vitamin D/day reduced their risk of hip fractures by 23%.⁸⁸

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 1,320 mg.

Phosphorous

Phosphorus is tied to calcium in bone structure and plays a significant role in CNS function. It is a part of the ATP (adenosine triphosphate) molecule, which is the body's energy carrier. Many enzymes contain as a base phosphoproteins. Phospholipids are also involved in nerve conduction.

A 1991 study with patients with Alzheimers showed the following: "marked differences in CSF levels of both calcium and phosphorus were observed in patients with dementia and aged controls when compared with adult controls. A significant decrease in both Ca and P in CSF was observed in Alzheimer's type dementia ($p < 0.01$) and multi-infarct dementia cases ($p < 0.01$)."⁸⁹

A study involving patients with systemic lupus (1990) conducted at the University of New Mexico reported: "Systemic lupus erythematosus (SLE) can produce profound disturbances in the central nervous system, characterized by encephalopathy, focal neurologic deficits, cerebral infarction, psychosis, and seizures." Ten patients with lupus were compared to age matched normal controls. Levels of ADP, ATP, sugar phosphates, phosphocreatine (PCr), inorganic phosphate, phosphomonoesters, and phosphodiesteres in the brain tissue were examined. The study showed significant decreases in ATP, and PCr levels were decreased to a greater extent than the ATP levels."⁹⁰

Calcium and phosphorus act together, balancing each other in many body functions. Phosphate is the primary ion in extra- and intra-cellular fluid. It aids absorption of dietary constituents, helps to maintain the blood at a slightly alkaline level, regulates enzyme activity, and is involved in the transmission of nerve impulses.

Toxicity: It is important that phosphorus and calcium are maintained in the correct balance. An imbalance can create a calcium deficiency. The recommended upper intake limit is set at 4000mg/day.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 840 mg.

Magnesium

Magnesium is one of the most abundant minerals in human tissue. Magnesium is found in high concentrations inside cells, particularly those of the heart and brain. The role of magnesium continues to grow in clinical importance as evidence suggests that magnesium deficiency is active in a number of disorders.

Magnesium plays a role as a co-factor in over 250 enzyme reactions. All enzymatic reactions utilizing the energy storage molecule, (ATP), adenosine triphosphate require magnesium. It is also required for DNA manufacture, protein synthesis and fatty acid synthesis

Like calcium, magnesium is also involved in nerve impulse transmission. It is involved in the maintenance of the membrane electric potential and the transport across membranes of potassium, sodium, and calcium.

Magnesium is necessary for the action of a compound which plays a vital role in transmitting messages from hormones and other stimuli which cause chemical reactions inside cells.

Vitamin D promotes magnesium absorption. However, recent studies suggest that calcium does not affect magnesium absorption.⁹¹

Magnesium deficiency affects body tissues. CNS symptoms of severe deficiency, include anorexia, personality changes, weakness, tiredness, vertigo, convulsions, nervousness, irritability, tremors, involuntary eye movements and irregular heartbeat.

The vitamin metabolism appears to be altered in some migraine sufferers and deficiency may contribute to symptoms through it's effects on neurotransmitters.⁹²

Magnesium studies show that it's use may be beneficial in the treatment and prevention of migraine. In a double blind study performed in 1996, researchers assessed the effect of magnesium in the prevention of migraine in 81 patients aged from 18 to 65. They were either given a placebo or magnesium supplement of 600 mg/day for 12 weeks. In weeks 9 to 12, the migraine frequency was reduced by 42 per cent in the magnesium group and by 16 per cent in the placebo group. The number of days with migraine and the drug consumption for symptomatic treatment per patient also decreased significantly in the magnesium group.⁹³ Magnesium was also found to be useful in the treatment of menstrual migraine.⁹⁴

Magnesium deficiency may also contribute to anxiety, sleeping problems, and (CFS) chronic fatigue syndrome. Low serum levels of magnesium have also been found in patients with anorexia, bulimia and patients with irritable bowel syndrome.

Chronic deficits in magnesium in children may be characterized by fidgeting, learning difficulties, anxious restlessness, and psychomotor instability in the presence of a normal IQ.⁹⁵

In a large scale observational study, parents of autistic children provided approximately 4000 completed questionnaires providing a rating on various treatments which their autistic children had undergone. The treatment with the highest ranking was high dosage magnesium and B6.⁹⁶

In other observational studies 116 children with ADHD were studied. Levels of magnesium were tested in serum, hair and red blood cells. A magnesium deficiency was found in 95% of the ADHD children. There was a negative correlation between distractibility in the ADHD children and the greater the deficiency in the magnesium.⁹⁷

Blood cell concentrations of magnesium appear to be low in women with (PMS) premenstrual syndrome. The calcium to magnesium ratio was found to be affected by female hormone fluctuations, which affect neurotransmitter levels causing premenstrual symptoms.⁹⁸ In 1991 an Italian study demonstrated the effects in a two month long magnesium supplementation trial on premenstrual symptoms in 32 women. Three hundred and sixty milligrams daily at three times a day were provided from the 15th day of the menstrual cycle to the onset of menstrual flow. The results demonstrated that magnesium supplementation assisted greatly and was effective in the treatment of premenstrual symptoms related to mood changes.⁹⁹

Magnesium sulfate injections have been shown to improve the symptoms of chronic fatigue syndrome.¹⁰⁰

Toxicity: Magnesium toxicity is rare as magnesium is found within body tissue in abundance and the body excretes excess. Clinical trials using 1080mg./day have been proven to be safe and well below toxic values.¹⁰¹

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 600 mg.

Copper

Copper is essential to the formation of many genes and enzymatic factors within the human body. It is well established that the SOD1 gene (Superoxide Dismutase) which protects the human cell from oxidation and free radical damage. SOD is based on a Copper-Zinc composition. A copper containing enzyme provides a vital role in energy production in human cells. Copper is mostly concentrated in the brain and liver. Copper is necessary for the synthesis of cell membrane phospholipids, and so helps maintain myelin, the insulating sheath that surrounds nerve cells. It also helps regulate neurotransmitter levels.

Copper and zinc require a proper balance of about 10:1 (zinc to copper) absorption ratio either one exceeds the balance uptake of the other becomes impaired.

Research has shown that the cerebral spinal fluid in the schizophrenic shows lower than normal levels of copper when compared to normal controls.¹⁰² Copper deficiency can impair the function of the nervous system. This impairment causes poor concentration, numbness and tingling, and a variety of nervous system disorders.

Copper deficiency in offenders: comparing 27 age and sex matched controls, diets of the 27 chronic juvenile offenders were low in copper.¹⁰³

Copper serum levels were shown to be depressed in patients with anorexia nervosa compared to controls.¹⁰⁴

As an interesting side note, up to 70 percent of the copper content of flour may be lost when it is refined.

Toxicity: Toxicity of copper is thought to be fairly rare but high concentrations (daily intakes of 200 mg and over) can cause effects such as nausea, vomiting, abdominal pain, diarrhea, muscle pains, heart problems, immune suppression and abnormal mental states. The lethal dose for copper may be as low as 3500mg.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 7.2 mg.

Iodine

Iodine has been classified as an essential trace element in human nutrition. The (WHO) World Health Organization has completed much research into the effects of the deficiency disorders stemming from lack of iodine in the human diet. The average adult body contains between 25 to 50 mg iodine, and the greater part is concentrated in the thyroid gland. The remainder is in thyroid hormones in the ovaries, blood and muscles.

Iodine plays an important role in the production of the thyroid gland hormones triiodothyronine and thyroxin, which set the metabolic rate of the body. Thyroid hormones are important for development of all organs, brain growth, nerves, skin and bones. The thyroid is involved in protein manufacture, cholesterol synthesis, carbohydrate absorption and the conversion of carotene to Vitamin A. Thyroxin is an important regulator of body weight. Low levels of iodine are responsible for lower production of the thyroid hormones, in turn causing hypothyroidism a serious condition of the human endocrine system. Other symptoms of hypothyroidism include fatigue, apathy, drowsiness, sensitivity to cold, lethargy, muscle weakness, weight gain and coarse skin.

Graves disease, a disorder of hyperthyroidism, is caused by an overactive thyroid. It results from a disruption in the mechanisms that control thyroid hormone function.

A 1996 study demonstrated that iodine deficiency may cause learning disabilities and poor motivation in children.¹⁰⁵

Toxicity: The average iodine intake in the USA is over 600 mcg per day. Iodine is rapidly absorbed from the gut. Excesses are excreted in the urine. A fatal dose is 2 to 3g of iodine.

Toxic effects from the iodide form of iodine are rare and may include a reduction of thyroid hormone secretion, acne, and inflammation of the salivary glands when doses reach 1,500mcg.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 204 mcg.

Potassium

Potassium has many functions, and is essential for protein synthesis, conversion of blood sugar into glycogen, stimulation of the movement of the intestinal tract, and activation of many enzymes.

Severe potassium deficiency can present symptoms of fatigue, vomiting, acute muscular weakness, paralysis, pins and needles, loss of appetite, low blood pressure, intense thirst, drowsiness, confusion and eventually coma. Muscle spasms, tetany, heart arrhythmias and muscle weakness can also be caused by increased nerve excitability associated with inadequate intake of potassium. The sudden death that can occur in fasting, anorexia nervosa or starvation is often a result of heart failure caused by potassium deficiency.

Potassium supplementation has been shown to be of benefit in menopause to control mood swings and fatigue.

Toxicity: No RDA has been set in the USA but the estimated minimum requirement for a healthy person is 2000 mg./day. Kidneys are the main regulators of body potassium levels, maintaining blood by controlling excretion. Supplementation of potassium in doses greater than **18,000mg** may cause muscular weakness, low blood pressure, mental confusion and eventually heart attack.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 240 mg.

Molybdenum

Since the 50's molybdenum has been considered an essential trace mineral.¹⁰⁶ The adult body contains about 9 mg with highest concentrations in the kidneys, liver, and skin. It is found as a part of the enzymes, xanthine oxidase, sulfite oxidase and aldehyde oxidase. These enzymes are responsible for the production of uric acid, a waste product of protein metabolism; carbohydrate metabolism; iron utilization; and sulfite detoxification.

Toxicity: Toxic effects of excess molybdenum intake include weight loss, slow growth, anemia, diarrhea, increased blood levels of uric acid and swelling in the joints. This may occur at intakes of 10,000 to 15,000 mcg./day. Molybdenum is conserved by the body at low intakes but is rapidly excreted in the urine when intake is too high.¹⁰⁷

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 144 mcg.

Zinc

Zinc is extremely important to numerous body functions. Zinc functions in over 600 enzymatic reactions in the body. It plays a key role in the synthesis and stabilization of human genes. It is necessary for cell division and the synthesis and degradation of carbohydrates, lipids and proteins, and is therefore essential for the growth and repair of tissue.

Zinc deficiencies are associated with birth defects and mental impairments. Several studies have reported birth defects and pre-term deliveries in mothers with zinc

deficiencies during pregnancy. They have an increased risk for mental impairment, small head size, and inter-uterine growth retardation.¹⁰⁸

Thyroid function is affected by a deficiency of minerals in the human diet. In this study reduced intake of both selenium and zinc lead to a 30% reduction of several thyroid hormones.¹⁰⁹

Zinc may play a role in calcium uptake in bone and modulate the effects of growth hormones, and is necessary for the production of brain neurotransmitters.

Healthy liver function and release of Vitamin A from the liver both require zinc. It is involved in the production of hydrochloric acid in the stomach and in the conversion of fatty acids to prostaglandins, which regulate body processes such as heart rate and blood pressure. Zinc is necessary for muscle contraction and maintaining acid-alkali balance.

Symptoms of zinc deficiency include eczema on the face and hands, hair loss, mental apathy, defects in the reproductive organs, delayed sexual maturation, menstrual irregularities, decreased growth rate and impaired mental development. Deficiency may also lead to postnatal depression, loss of the senses of taste and smell, anemia, poor appetite, impaired conduction and nerve damage, white spots on the nails, mental disorders, susceptibility to infections, delayed wound-healing and impotence in men.

Low levels of zinc have been found in sufferers of the eating disorder, anorexia nervosa. And this complex disorder may be exacerbated by zinc deficiency. Initial dieting may lead to deficiency which then reduces the senses of taste and smell, thus exacerbating poor appetite.

The symptoms of premenstrual syndrome may be exacerbated by zinc deficiency. In a study published in 1994, researchers at Baylor College of Medicine, Houston, Texas assessed copper and zinc levels in ten PMS sufferers and compared these to those in normal controls (non-sufferers). Results showed lower zinc levels in the latter half of the menstrual cycle in PMS patients.¹¹⁰

Studies have shown that zinc may be of benefit as part of the therapy for anorexia nervosa. Zinc supplements have been found to increase the weight gain of anorexia patients. Researchers involved in a 1994 Canadian randomized, double-blind, placebo-controlled trial gave a daily dose of 100 mg of zinc or a placebo to 35 female anorexia patients until they achieved a 10 per cent increase in body mass index (BMI). The rate of increase in BMI of the zinc supplemented group was twice that of the placebo group.¹¹¹

Zinc deficiency may be associated with mental lethargy, emotional disorders and irritability.¹¹²

A recent Japanese study found low blood levels of zinc in people suffering from tinnitus (ringing in the ears). Supplementation of zinc improved the condition.¹¹³

Toxicity: Studies are being conducted to see whether zinc supplementation has any benefit in the treatment of AIDS. Some studies have shown improvement in immune function while using zinc doses of **200 mg/day for 30days** (1995 Italian AIDS study - zinc sulfate supplements). Results showed stabilization in body weight and increases in CD4+ lymphocytes and immune-stimulating hormone levels.

Toxic effects of zinc are rare as excessive absorption is usually prevented by the abdominal pain, nausea and vomiting that very high doses (above 200 mg) cause.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 48 mg.

Chromium

Chromium is also classified as an essential trace element. Chromium has been found to be essential for body sugar metabolism and is the base of (GTF) glucose tolerance factor working with insulin it moves glucose into cells where it generates energy. The average human body should contain about 6 mg. of chromium.

Symptoms of chromium deficiency include high blood fat and cholesterol levels and diabetes-like symptoms of glucose intolerance, weakness, depression, confusion, weight loss, thirst, hunger and frequent urination.

Chromium tissue levels have been shown to decrease with age. British researchers in a study published in 1997 tested for chromium levels in hair, sweat, and serum samples obtained from over 40,000 patients.¹¹⁴ The results showed highly significant age-related decreases in older people. Impairment from chromium deficiency appears to be a major issue.

In research completed at the University of Texas it was determined by Dr. Kenneth Blume that chromium acts as an active transporter of the amino acid tryptophan in moving it across the blood-brain barrier where it is converted into serotonin. An important function of in CNS control over issues like Tourette's Syndrome, Clinical Depression and ADHD.

Toxicity: Many weight loss programs are now advocating the use of chromium with doses at 1,500 mcg/day and above.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 624 mcg.

Iron

Iron plays a significant role in oxygen transport in the body. It is the base of the hemoglobin molecule, which drives the blood oxygen activity. Enzymes involved in many metabolic functions require iron. Thyroid hormones, which regulate metabolic processes, need iron for production. It is necessary for cell division and growth through its role in DNA synthesis. It is also essential for protein metabolism. Iron also plays a role in oxygen transfer involving the production of energy in cells.

Iron deficiency may be the most common nutritional deficiency in the USA. Results from the third National Health and Nutrition Examination Survey (1988-1994) suggest that iron deficiency and iron deficiency anemia are still relatively common in toddlers, adolescent girls, and women of childbearing age. Nine percent of toddlers age 1 to 2 years, and 9 percent to 11 percent of adolescent girls and women of childbearing age were iron deficient; of these, iron deficiency anemia was found in 3 percent and 2 - 5 percent respectively. These percentages correspond to approximately 700,000 toddlers and 7.8

million women with iron deficiency; of these, approximately 240,000 toddlers and 3.3 million women have iron deficiency anemia. Iron deficiency occurred in around 7 percent of older children, and those older than 50 years, and in 1 per cent of teenage boys and young men.¹¹⁵

An interesting case series with two adolescents exhibiting conduct, dysthymic and movement disorders involved iron deficiency. The case research was concluded with the following comments: "...the weight of the evidence suggests that correcting the nutrient deficit may be an essential step toward a refinement of therapeutic strategies."¹¹⁶

Iron deficiency may point to conduct problems in adolescents and children. A study of 163 patients who were incarcerated delinquents (male and females) showed a significantly higher prevalence of iron deficiency.¹¹⁷

Symptoms of iron deficiency include anemia, fatigue, rapid heartbeat, breathlessness, inability to concentrate, giddiness, disturbed sleep, severe menstrual pain and bleeding, cracks in the corners of the mouth, eye inflammation, mouth ulcers and hair loss. Low blood plasma levels of iron can cause generalized itching, especially in elderly people.

Compared to age and sex matched controls (176 children) the serum, urine and scalp hair iron levels of 486 hyperactive children indicated significantly reduced levels of iron. This suggests the need for iron supplementation in hyperactive children.¹¹⁸

Iron supplements may improve verbal learning and memory in those suffering with iron deficiency. In a study published in *The Lancet* in 1996, researchers at Johns Hopkins University evaluated 78 girls with non-anemic iron deficiency and measured their cognitive ability, memory and concentration. The girls were then divided into two groups, some were given a placebo and some were given iron supplements. After eight weeks, measurements showed an increase in iron levels in the supplement group while the levels in the placebo group remained low. Tests showed that the girls who took the iron supplements performed better on the verbal learning and memory tests than the girls who took placebo. Both groups scored the same on tests measuring their ability to pay attention and concentrate. There was a direct relationship between how much the blood iron levels went up and the ability to learn.¹¹⁹

Iron deficiencies are also cited in anorexia nervosa research.¹²⁰

Toxicity: Doses of 25 to 75 mg per day have been taken without side effects, although those with iron overload or kidney disorders might develop symptoms at lower doses. The usual dose for treatment of deficiency is 100 mg per day in adults.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 13.74 mg.

Manganese

Manganese, an essential trace element for humans, plays an active role in CNS function. . The average adult body contains between 10 and 20 mg with the highest concentrations in the bones, liver, kidneys and heart. Manganese appears to be involved in many enzyme systems, although its functions are not well understood. It acts as a co-factor for enzymes necessary for energy production and is involved in glucose metabolism, the stimulation of glycogen storage in the liver, protein digestion and

cholesterol and fatty acid synthesis. It is also necessary for the synthesis of DNA and RNA.

Manganese is necessary for growth and maintenance of the nervous system. It also plays a role in formation of blood clotting factors, female sex hormone function and thyroid hormone function. One form of the antioxidant enzyme, superoxide dismutase, contains manganese. Laboratory studies have shown that it can protect brain cells from the type of damage seen in stroke and Alzheimer's disease.¹²¹

It may also help to protect against liver damage. Manganese superoxide dismutase levels are higher in alcoholics and may help to protect against oxidative damage by alcohol.¹²²

Manganese supplements have also been used successfully to treat schizophrenia¹²³, mania and other psychoses.

Hair analysis in observational studies have shown lower than normal levels of manganese in schizophrenic patients.¹²⁴

Toxicity: Toxic effects from oral ingestion of manganese are very rare and include lethargy, involuntary movements, changes in muscle tone and posture.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 9.6 mg.

Selenium

Selenium was identified as an essential trace mineral for humans in the 1970s. A selenium-based enzyme is involved in the production of thyroid hormones. Studies have shown that thyroid hormones in elderly people are influenced by selenium status.¹²⁵ In other studies thyroid function was affected by lack of minerals. Reduced intake of both selenium and zinc lead to a 30% reduction of several thyroid hormones.¹²⁶

According to a Lancet publication in July of 2000, selenium also plays a role in CNS mood control. In this study a deficiency was linked to adverse mood states.¹²⁷

A 1996 study completed at a USDA Human Nutrition Research Center suggests that people with low selenium levels experience depressed moods.¹²⁸

Selenium is involved in maintaining liver function and protein synthesis. It also protects against toxic minerals such as arsenic, cadmium, mercury and lead.

Selenium may reduce anxiety. In a Double blind trial 50 patients randomly received a daily supplement of either 100mcg of selenium or placebo. An improvement in mood and a decrease in anxiety was seen in the selenium group vs. the placebo group.¹²⁹

Toxicity: Selenium toxicity can occur at doses of 600 to 750 mcg. Early signs of selenium toxicity include fatigue, irritability and dry hair.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains 204 mcg.

Nickel

The average adult body contains about 10mg. of nickel and it is found in body tissues. Nickel is concentrated in genetic material and is involved in protein structure and function.

Deficiency in animals indicates decreased growth, dermatitis, liver damage, cell mutation and reproductive abnormalities. Low blood levels of nickel may be found in those with liver and kidney disease.

Studies indicate a highly variable dietary intake of nickel, but most averages are about 0.2-0.7 mg per day.

Toxicity: There is no stated toxicity for nickel.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains minimal amounts of this nutrient.

Vanadium

Vanadium may act as a co-factor for enzymes involved in blood sugar metabolism, lipid and cholesterol metabolism, fertility, thyroid function, hormone production and neurotransmitter metabolism. Vanadium is mainly stored in bone & fat cells. Vanadium may be beneficial in treating subnormal thyroid function.

Toxicity: There is no RDA for vanadium. In a study published in 1996, researchers at the Albert Einstein College of Medicine in New York compared the effects of **100 mg/day of oral vanadyl sulfate** in moderately obese diabetic and nondiabetic people. The results showed improvements in both liver and skeletal muscle insulin sensitivity in diabetics. There was no toxic side effects identified using such a high dosage of vanadium.¹³⁰

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains minimal amounts of this nutrient.

Boron

Boron is distributed throughout the human body with the highest concentration in bone.

Boron seems to be essential for healthy bone and joint function. It affects cell membranes and the way signals are transmitted across these membranes and has a significant role in nerve signal transmission. It also plays a role in converting vitamin D to its more active form, thus increasing calcium uptake.

A boron deficiency may also decrease mental alertness.¹³¹

Toxicity: There is no RDA for boron. A safe and adequate daily intake is estimated to be between 1 and 10 mg. Toxic effects appear at intakes of about 100 mg. A fatal dose in adults is 15 to 20 g and in children 3 to 6 g.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains minimal amounts of this nutrient.

Germanium

GE-132 Sesquioxide is the organic form of germanium. It is the active ingredient in garlic and is found in other botanicals including aloe vera and comfrey. In the 1985 Sept/Oct edition of Anticancer Research a study which showed positive results with animals inoculated with cancer cells and then treated with germanium showed an increase in the body's defense mechanisms.

GE132 was to be identified as an oxygen catalyst, body detoxifier, an adaptogen, and most importantly an electrical impulse stimulator.

GE-132 may stimulate production of gamma-interferon providing relief to CFS patients.¹³²

In clinical research with patients suffering with chronic fatigue syndrome, clinicians report that between 20% and over 50% of their patients given GE-132 150-500mg./day showed substantial symptom relief.¹³³

Toxicity: GE-132 was evaluated by the Welfare Ministry of Japan and is listed in their "Guidelines for Manufacturers". Animal and human studies confirmed that GE-132 is safe in humans up to the equivalent of ten of grams per day.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains minimal amounts of this nutrient.

Methionine

Methionine is one of the sulphur containing amino acids and is important in body function. It acts as a lipotropic factor in preventing excess fat buildup in the liver and the body.

Toxicity: There is no toxicity rating for methione.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains minimal amounts of this nutrient.

Phenylalanine

Phenylalanine is very important to CNS function as it a precursor to the amino acid tyrosine. The neurotransmitters norepinephrine and dopamine are precursored by tyrosine. Without tyrosine the production of these very important transmitters would cease.

In an observational study involving 28 patients with ADHD the plasma phenylalanine levels were determined and compared to 20 controls. The ADHD group has significantly lower plasma levels of phenylalanine, suggesting that deficiency may be one of the underlying causes of ADHD.¹³⁴

Toxicity: There is no toxicity rating for phenylalanine.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains minimal amounts of this nutrient.

Bioflavenoids

The bioflavenoids have a vitamin C like effect providing general health to the body and cellular mass. "Proanthocyanidin" is one of the names used to describe a powerful bioflavonoid complex known as Procyanidolic Oligomers. Proanthocyanidin is one of the few antioxidants that crosses the blood/brain barrier to protect neural cells.

Flavonoids were discovered by Nobel Prize-winning biochemist Albert Szent-Gyorgi, who labeled them "Vitamin P". He discovered that they enhanced the function of vitamin C, improving absorption and protecting it from oxidation. Citrus bioflavonoids have been well researched and studied in human nutrition.

Toxicity: There is no stated toxicity for bioflavonoids.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains minimal amounts of this nutrient.

Grape seed extract

Grape seed extract, like bioflavonoids have a Vitamin C – Vitamin E like effect providing general health to the body and cellular mass. Proanthocyanidins have been used therapeutically for decades in Europe to improve circulation, reduce edema and varicose veins.

Toxicity: There is no stated toxicity for grape seed extract.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains minimal amounts of this nutrient.

Inositol

Inositol is a B vitamin which is closely associated with choline. It's concentration in the human body is the second highest in the B vitamins. Inositol expressed as phosphatidylinositol has function in cell structure and when combined with choline it provides a source of brain cell nutrition.

In a double blind controlled trial, 12 grams/day of inositol, were administered to 28 depressed patients for a four-week period. A significant benefit for inositol compared to placebo was found at week 4 on the Hamilton Depression Scale. Frequency and severity of panic attacks and severity of agoraphobia declined significantly with inositol compared to placebo. Side effects were minimal. The same researchers also tested the effectiveness of inositol supplements in panic disorders and obsessive compulsive disorder, and found beneficial effects.¹³⁵

Inositol supplementation treats agoraphobia and panic attacks. In a double blind crossover trial 21 patients suffering with panic attacks with or without agoraphobia were

administered 12 grams of inositol and placebo in random order for 4 weeks each. The frequency and severity of the panic attacks and agoraphobia were significantly less when using inositol vs. the placebo.¹³⁶

Inositol is a component of cell membranes and the myelin which insulates nerve fibers.

Toxicity: No deficiency or toxicity has been identified for inositol, in spite of its presence in a wide variety of foods.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains minimal amounts of this nutrient.

Gingko Biloba

Gingko is a herb which has been proven to have the effect of vascular dilation. Hence it has been proven to have a positive affect in Dementia and ADHD providing increased blood flow to the brain and central nervous system. Ear problems are improved with Gingko Biloba, due to improved blood flow to the nerves to the inner ear. It has been found to assist patients suffering with chronic ringing in the ears (tinnitus).

Toxicity: There is no stated toxicity for gingko biloba.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains minimal amounts of this nutrient.

Glutamine

Glutamic acid, the precursor to the amino acid gluamine is found abundantly in vegetable proteins. Glutamine is concentrated in the brain and with the combining of Vitamin B6 forms (gaba) gamma-aminobutyric acid, an important neurotransmitter. Thus glutamic acid has been associated with successful treatment of schizophrenia, and other brain disorders.

Toxicity: Not established - glutamic acid is very common in human food products.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains minimal amounts of this nutrient.

Choline (B vitamin)

Recent evidence suggests that choline is an essential nutrient in humans. Small quantities are synthesized in the liver with the help of Vitamin B12, folic acid and the amino acid, methionine. Choline is an important component of cell membranes and assists in the transmission of signals inside cells. Myelin contains choline and is the insulating fabric around the nerves. Choline precursors the synthesis and release of the neurotransmitter acetylcholine, which is involved in nerve and brain function.

Choline deficiency in animals has been proven to cause nerve degeneration and dementia.

Choline has been used to treat brain disorders such as Alzheimer's disease and Huntington's chorea, in which acetylcholine levels are low.

Some studies have shown improvements in mental performance after choline treatment.¹³⁷

In a 1994 study, lecithin was given to patients with Alzheimer's disease daily in doses of 1000 mg for 30 days. Results showed slightly improved mental performance.¹³⁸

Choline supplements have been shown to provide benefit in the treatment of bipolar disorder.¹³⁹

Five out of six patients with Bipolar disorder showed significant relief of symptoms following the administration of a choline supplement.¹⁴⁰

Bipolar patients (10) treated with choline achieved a permanent remission of mania.¹⁴¹

A clinical trial with 70 ADHD children and adolescents using choline provided positive results. All trial patients demonstrated some positive results. Titration occurred to 3000 mg/day of choline.¹⁴²

Toxicity: The tolerable upper intake limit has been set at 3g/day.

EMPowerplus at the full loading dose of 15 capsules or 4 scoops of powder per day contains minimal amounts of this nutrient.

2.5 Combined Nutrient Supplementation Research

A double blind study, with 62 jailed delinquents ages 13-17 took a vitamin-mineral supplement for 3 months. A significant difference was found between the active group and placebo group for violent and non-violent antisocial behavior following the trial. The study showed 113 violent acts during the baseline and 11 during intervention.¹⁴³

Another controlled study investigated 40 children housed in a correction facility using a vitamin-mineral supplement for a 6-week period. Rule violations for the previous 6 –12 weeks were compared to the number of rule violations while the children were supplemented showing a significant change in behavior. Fifty-five percent or 22 subjects stopped getting into trouble altogether.¹⁴⁴

A nutritional supplementation study researched a high potency broad spectrum product. Twenty-three agoraphobic patients used the nutrient for 3 months. Nineteen of the 23 patients showed significant improvement (dramatic) and 11 of the 19 were free of panic attacks.¹⁴⁵

3. Possible Interfering Factors

The human body is a marvelous organism with all faculties and facilities necessary to control and regulate itself. It is homeostatic, always seeking to bring itself to a state of balance. An example of this is the blood sugar control system operative within the body.

If we increase the intake of sugars, our body will move immediately to reduce and control plasma sugar levels by introducing insulin as a control mechanism, thereby bringing plasma sugar levels within a defined set of parameters. Another example is the CNS's ability to regulate the levels of various neurotransmitters. If the correct level of nutrients is found within the body it can accomplish the task and adapt to its ever-changing internal and external conditions. Unfortunately there are factors which interfere with this homeostatic system, causing the body to lose control. Here we will briefly discuss some of those factors, which by experience we have learned have negative effects on CNS balance.

- a. **Street Drugs** can cause a major imbalance in CNS function. Street Drugs cause an in-balance in CNS function by altering the bio-chemical state of the individual. When street drugs are used in combination with the Truehope program the participant will ultimately regress due to an inability to maintain adequate neuro-chemical balance. This includes the use of botanicals such as marijuana and hashish as well chemicals such as PCP, DMT etc.
- b. **Medications** whether prescribed or un-prescribed may adversely affect the operation of the CNS. For example, the use of anti-psychotics and antidepressants in combination with the program will manipulate the CNS out of balance. One cannot restore the proper neuro-chemical balance and remain on a medication designed to alter that balance. For example, Ritalin may stimulate the ADHD patient positively, but Ritalin given to an individual not suffering with ADHD will cause that individual to experience an abnormal mood elevation. All Medications should be closely looked at to determine their affects on CNS operation. Even if a medication does not directly influence CNS function it may have a negative affect as a secondary factor. For example medications that affect the digestive tract can also effect CNS operation. Tagamet, Prilosec and other anti-acids reduce the level of hydro-chloric acid in the stomach. This reduction interferes with the body's digestion of food (especially proteins) and throws the body into a nutrient deficient state. Any over the counter medication containing a psycho-active ingredient, such as codeine, will interfere with the body's response to the Truehope program.

Quote:

"Even its basic makeup defies logic. Salt is a blend of sodium and chlorine – the first is a metal so unstable that it bursts into flame when exposed to water; the second a lethal gas. When we swallow the blend, it forms hydrochloric acid in our stomachs...**Suicidal?** No, an absolute necessity for life."- G Young, National Geographic

- c. **Antibiotics** taken orally have a negative effect on the Truehope program. When an antibiotic is introduced into the stomach it will unselectively destroy more of the micro-flora than just a single pathogen. Normal levels of micro-flora in the digestive tract are absolutely essential for the breakdown of food and release of nutrients to the body. Compromised levels of micro-flora therefore create element deficiencies. Anti-biotics will always exacerbate symptoms of a CNS disorder and may completely negate the benefits of the Truehope program. If antibiotic use is required we have found that taking it intravenously or intramuscularly will prevent its damaging effect on intestinal micro-flora. Supplementation with live bacterial

cultures may help to restore compromised levels of intestinal bacteria as well.

- d. **Caffeine** acts as a CNS stimulant destroying CNS balance. The following research bears this out:

Beck Depression inventories were higher with a group of healthy college students who were moderate to high caffeine consumers, academic scores were also lower. Low caffeine consumers scored better (lower) on the depression scale.¹⁴⁶

In another study with depressive patients who were consuming >750 mg. daily of caffeine, 50% showed severe depression as rated on the Beck Depression Scale. Such scores were significantly higher than low or moderate users of caffeine in the same population.¹⁴⁷

A double blind case trial indicated that a patient with emotional stress was improved using a sugar – caffeine free diet. The patient was tested with sugar and caffeine under double blind conditions. Only a use of caffeine brought a return of the depressed mood.¹⁴⁸

Caffeine has been shown to increase serum concentrations of adrenaline and nor-adrenaline, having the effect of increased depression and anxiety.^{149 150}

The New England Journal of Medicine reported on the following double blind study: 62 normal adults with low to moderate caffeine intake were studied at baseline, they randomly received caffeine or placebo capsules. The subjects had abnormally high scores on an Anxiety measure (State-Trait Inventory Score) during withdrawal (placebo period). Thus demonstrating the addictive nature of caffeine and the resulting anxiety associated with withdrawal.¹⁵¹

- e. **Herbals** in some instances can offer significant answers to particular problems just being “natural” however does not make them either efficacious or safe. For example, a young female participant suffering with bipolar disorder (principally depression) was finding significant resolve to her disorder taking the Truehope program. Her menstrual cycle brought back some symptoms of depression, which her mother decided to address temporarily with St John’s Wort. The next morning her parents were awakened to find their 17-year-old daughter kneeling and praying in the middle of the city street with cars driving around her.

St Johns exerts has a drug like effect on the body similar to number of prescription anti-depressants. This ability when combined with the chemical restorative properties of EMPowerplus creates an ADR (Adverse Drug Reaction) which is also similar to the prescriptive drug medications. The over production of serotonin created in either case has the potential to elevate mood to a state of severe mania and delusion.

Any herbal preparation that has a psychotropic effect should not be used in conjunction with the Truehope program. Such preparations include MaHuang, Guarana, Ephedera and its extracts, to mention only a few. It is important to be fully aware of what you are taking and their potential effects.

- f. **Alcohol** interferes with CNS operation in a powerful way. Much research has been completed on the effects of alcohol and its use in relation to CNS disorders.

"Intoxication with brain depressants, especially alcohol, can cause clinically relevant changes in mood, with prolonged intoxication likely to induce depressive symptoms that resemble those seen in major depressive disorder".¹⁵²

"Depression and drug abuse may be associated with alterations in some of the same neurotransmitters systems".¹⁵³

Depression may be engendered with the use of alcohol by reducing CNS catecholamine levels.¹⁵⁴

Alcohol use may increase brain serotonin levels, and may have a reversal effect as its effects wear off, creating a vicious cycle of self medicating.¹⁵⁵

Of all of the systems in the human body none is more sensitive then the Central Nervous System.

- g. **Tobacco** has a negative effect on body health and longevity. Its use will only promote general illness. Nicotine exerts a powerful psychotropic effect on the nervous system.
- h. **Yeast** in many situations is created by antibiotic abuse. The intestinal micro-flora is altered with antibiotic use, giving candida an opportunity to flourish. Candida robs the body of nutrients in a parasitic fashion creating a state of deficiency throughout the body. There are many products available to assist with yeast control.
- i. **Parasites** also rob the body of nutrients and like yeast can create deficiencies.
- j. **Flu and other transient illnesses** create instability in program participants. One cannot benefit from nutrients that cannot be kept in the system. Vomiting or diarrhea prevent the body from obtaining any benefit from the supplement. Constipation also interferes with intestinal function and therefore the uptake of nutrients becomes compromised.
- k. **Immunizations** can have the same interfering effect as an illness. As the body uses its resources to defend itself from foreign invasions by pathogens, the body's nutrient resources become depleted and are less available for normal CNS function.
- l. **HRT (hormone replacement therapy)** or the replacement of any natural hormone has the potential to create an imbalance in the regulation of body function. This would include the use of thyroxin. The use of any of these hormones would require careful monitoring by competent measures to ensure that correct balance is maintained. The use of EMPowerplus has the potential to restore proper hormone balance thus the requirement to monitor hormone levels.
- m. **Fad diets** can create problems for the participant. Limiting varieties of food types on crash diet plans can affect body chemistry. Drinking excessive amounts of

water can flush needed body minerals out of the kidney, also creating deficiencies. Even limiting salt intake to excess can be harmful.

Summary: This list is not all-inclusive. There are many more concerns, which could be addressed including: sleep deprivation, over-consumption of refined foods and sugars, disease of the bowel, persistent loose and / or watery stool, constipation, irritable bowel syndrome, over-use of laxatives, irregular sleep and meals, and over-use of antacid medications.

4. Conclusion

In preliminary studies, EMPowerplus has shown to be a safe and effective way of treating the symptoms of Bipolar Disorder and other types of mental illnesses. We are confident that further research will ultimately prove that many types of mental disorders can be effectively treated using carefully formulated vitamin and mineral supplementation.

Questions about this manual or about the EMPowerplus program of supplementation and support can be directed to Truehope Nutritional Support Ltd. at 1-888-878-3467.

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