INTEGRATIVE METABOLIC™

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DETOXICATION FACTORS™

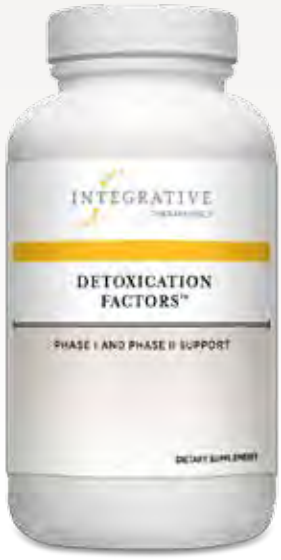
PHASE I AND PHASE II SUPPORT

Liver detoxication (also known as biotransformation) occurs in two phases. During Phase I, a variety of oxidations, reductions, and hydrolyses change both exogenous substances (e.g., drugs, pesticide residues, pollutants) and endogenous compounds (e.g., hormones and metabolic byproducts) into more water-soluble metabolites. In Phase II detoxication, the liver conjugates Phase 1 metabolites to compounds— such as glucuronides, methyl groups, glutathione, sulfates, and amino acids—that make them easier to eliminate.[1]

Developed to support healthy Phase I and II detoxication pathways in the liver, Detoxication Factors provides an expertly-formulated combination of 38 ingredients.* It can be used for everyday nutritional support, for periods of increased oxidative stress and targeted cleansing, or incorporated into individualized endocrine, cardiovascular, or cellular support protocols.*

Detoxication Factors contains:

- **Antioxidants**—nutrients such as Vitamins A, C, and E which have been shown to defend against oxidation and free radical damage*
- **Conjugating agents**—compounds that bind and/or support the conversion of fat-soluble toxins for elimination*
- **Nutritional cofactors**—vitamins, minerals, enzymes, botanical extracts, and other nutrients that participate in liver biotransformation processes*



wheat free · GF gluten free · soy free · dairy free

1. Cashman JR, Perotti BYT, Berkman CE, Lin J. Pharmacokinetics and molecular detoxication. *Environ Health Perspect* 1996;104(Suppl 1):23–40.

DETOXICATION FACTORS™

How It Works

The human liver is responsible for an enormous number of biologic activities. Among its many functions, it is the primary organ responsible for the detoxification, or biotransformation, of xenobiotics (substances foreign to our bodies). The liver metabolizes xenobiotics in two phases. Nutritional and herbal supplements can be directed at one or both of these phases to achieve specific support.* Endogenous hormone balance can also be modified through the use of phyto-nutritional agents with demonstrable support.*

Biotransformation occurs in two phases. During Phase I, a variety of oxidations, reductions, and hydrolyses change both exogenous substances (e.g., drugs, pesticide residues, pollutants) and endogenous compounds (e.g., hormones, metabolic byproducts) into more water-soluble metabolites. In Phase II detoxication, the liver conjugates Phase I metabolites to compounds— such as glucuronides, methyl groups, glutathione, sulfates, and amino acids—that make them easier to eliminate.[1]

Formulated to support hepatic detoxication, Detoxication Factors offers comprehensive nutritional support for Phase I and II detoxication pathways.* This expertly-formulated supplement includes select amino acids, antioxidants, vitamins, minerals, and trace elements to support healthy detoxication.*

Phase I Nutritional Support

The following ingredients in Detoxication Factors support Phase I detoxication.

Reduced glutathione (GSH)

Gluthathione is the most important intracellular antioxidant and the only free radical quencher found within mitochondria. GSH has enzymatic and non-enzymatic antioxidant functions. As an enzymatic antioxidant, GSH is a cofactor along with the selenium-containing enzyme, glutathione peroxidase (the primary pathway by which hydrogen peroxide produced during cell respiration is reduced). GSH is also a non-enzymatic, or direct, antioxidant and as such it can quench free radicals and free radical chains directly.*[2-4]

N-Acetyl-L-Cysteine (NAC)

NAC is a precursor to glutathione and is an antioxidant and free radical scavenger.* It promotes healthy detoxication and elimination of xenobiotics and intestinal endotoxins, donates sulfhydryl groups, enhances glutathione-S-transferase activity, promotes liver detoxication, and inhibits xenobiotic biotransformation.*[5-7]

Coenzyme Q10 (CoQ10)

Coenzyme Q10 (CoQ10) is ubiquitous in biological systems. It is found in all tissues of the body, but is concentrated in the adrenal glands, kidneys, lungs, spleen, and especially the heart. The primary role of CoQ10 is in oxidative phosphorylation, as an integral component of the mitochondrial energy-transducing assembly. As an antioxidant, CoQ10 is especially active in cell membranes. It protects from oxidative damage and enhances the antioxidant function of vitamin E.*[8-10]

Vitamin C

Vitamin C is a well-known antioxidant and plays an important role in the liver's detoxication activities, particularly hydroxylation reactions in Phase I.* Vitamin C is required for the activity of the Mixed-Function Oxygenase (MFO) system. This xenobiotic-metabolizing system operates in the microsomes and reticuloendothelial tissues of the liver. Integrity of cytochrome P-450 electron transport depends on vitamin C, and it is also involved in the breakdown of cholesterol by hydroxylation occurs in the liver microsomes, as well as metabolism and excretion of heavy metals.*[11-14]

Vitamin E

Vitamin E is a powerful free radical scavenger, halting the chain reaction of oxidation in biological membranes.* Despite the presence of glutathione peroxidase and other antioxidant systems, vitamin E is needed in membranes to protect against hydroxyl radicals produced during cellular respiration. Conversely, if other antioxidant enzymes are decreased (e.g., lower glutathione peroxidase activity), the requirement for vitamin E's free radical scavenging activity increases proportionally.[15-17]

Selenium

Selenium is an antioxidant and a cofactor for glutathione peroxidase, the enzyme that catalyzes GSH reduction reactions. It is especially useful in supporting the elimination of heavy metals, such as mercury and arsenic.* It also supports cellular function, supporting healthy cell cycling activity.*[18-20]

Phase I Nutritional Support Continued

Quercetin

Quercetin and its immediate metabolites are bioflavonoids and antioxidants that effectively protect cells and tissues against reactive oxygen species, free radicals, and other oxidizing intermediates.*[21,22]

Milk Thistle (Silybum marianum)

Milk Thistle contains several beneficial phytochemicals, including silymarin, silybin, and silybinin. These constituents make milk thistle a unique hepatoprotective agent.* Silymarin has been shown to protect liver cells.*[23-28]

Phase II Nutritional Support

The following ingredients in Detoxication Factors support Phase II detoxication.

Calcium D-glucarate

Calcium D-glucarate is a precursor of glucarolactone (GL), which inhibits the enzyme glucuronidase. Supplementation increases the net elimination of toxins and steroid hormones via glucuronidation and is also shown to support healthy cellular proliferation.*[29,30]

Reduced glutathione (GSH)

Conjugation with glutathione S-transferase enzymes is critical to protect vital cellular components. These enzymes catalyze reactions that conjugate and detoxify a diverse group of xenobiotics. The cofactor for reactions catalyzed by glutathione S-transferase enzymes is reduced glutathione, a tripeptide composed of glycine, cysteine, and glutamic acid. Glutathione S-transferase enzymes protect cells from electrophilic xenobiotic compounds. These compounds, and their reactive intermediates produced by cytochrome P-450 metabolism, bind with GSH instead of covalently bonding with cellular constituents and damaging cells.*[31, 2-4]

N-Acetyl-L-Cysteine (NAC)

Sulfation is another important conjugation reaction supported by NAC and represents an effective means to support detoxication.* In addition to detoxicating substances, sulfation is important in the metabolism of endogenous compounds, such as catecholamine, some steroids, and bile acids.[32] By supporting Phase II sulfation and GSH metabolism, NAC supports cellular health and aids in excretion of toxins.*[33, 34]

B vitamins

B vitamins, such as B6, B12, and folate play essential roles in hepatic methionine metabolism.* In transmethylation reactions, 5-methyltetrahydrofolate (5-MTHF) is substrate with homocysteine in the vitamin B-12–dependent methionine synthase (MS) reaction to yield tetrahydrofolate (THF) and methionine. Vitamin B-6 is a cofactor for two reactions, cystathionine ß synthase and cystathionase, to produce cysteine and GSH from their precursor homocysteine.[35-37]

Glycine, Taurine, and Glutamine

Amino acid conjugation primarily utilizes glycine, glutamine, and taurine. Glutamine, a conditionally essential amino acid, is involved in the detoxication of ammonia, while taurine is needed for bile acid conjugation.*[38, 39]

Ornithine aspartate

Ornithine aspartate supports healthy ammonia levels, healthy mental status, and liver health and function.*[40, 41]

Supplement Facts

Serving Size 2 capsules — Servings per container 30 or 60

Amount per 2 capsules		%DV*
Total Carbohydrate	2 g	**<1%***
Vitamin A (75% as natural beta carotene with mixed carotenoids and as retinyl palmitate)	6,668 IU	133%
Vitamin C (as magnesium ascorbate)	167 mg	278%
Vitamin E (as d-alpha tocopheryl succinate)	83 IU	277%
Thiamin (as thiamin HCl, thiamin pyrophosphate)	8.7 mg	580%
Riboflavin (as riboflavin-5'-phosphate)	8.3 mg	488%
Niacin	10 mg	50%
Vitamin B6 (as pyridoxal-5'-phosphate)	10 mg	500%
Folic Acid	200 mcg	50%
Vitamin B12 (as methylcobalamin)	42 mcg	700%
Biotin	66 mcg	22%
Pantothenic Acid (as calcium pantothenate)	33 mg	330%
Magnesium (as magnesium citrate, malate, ascorbate)	78 mg	20%
Zinc (as zinc picolinate)	10 mg	67%
Selenium (as L-selenomethionine)	66 mcg	94%
Copper (as copper sebicate)	334 mcg	17%
Manganese (as manganese glycinate)	2 mg	100%
Molybdenum (as molybdenum citrate)	50 mcg	67%
Calcium D-Glucarate	66 mg	**
Choline (as choline bitartrate)	66 mg	**
Glycine	66 mg	**
L-Glutamic Acid HCl	66 mg	**
L-Glutamine	66 mg	**
L-Methionine	66 mg	**
L-Taurine	66 mg	**
NAC (as N-acetyl L-cysteine)	66 mg	**
Quercetin (dihydrate)	66 mg	**
Broccoli (*Brassica oleracea italica*) Sprout Powder (standardized to contain 0.4% sulforaphane)	33 mg	**
Inositol	33 mg	**
L-Ornithine L-Aspartate	33 mg	**
L-Carnitine (as L-carnitine tartrate)	16 mg	**
L-Glutathione, reduced	16 mg	**
L-Histidine	16 mg	**
L-Serine	16 mg	**
Milk Thistle (*Silybum marianum*) Seed Extract	16 mg	**
Turmeric (*Curcuma longa*) Extract (standardized to contain 95% curcuminoids)	16 mg	**
Natural Coenzyme Q10 (trans-CoQ10) (ubiquinone 10) (derived from yeast fermentation)	8.4 mg	**
Green Tea (*Camellia sinensis*) Extract (standardized 80% to contain catechin and 98% polyphenols	8.3 mg	**
Grape (*Vitis vinifera*) Seed Extract (90% polyphenols including procyanidolic oligomers)	3.4 mg	**
Catalase	16 mcg	**

*Percent Daily Values (DV) are based on a 2,000 calorie diet.
**Daily Value not established.

Other ingredients: gelatin, cellulose, and silicon dioxide.

Contains no: sugar, salt, yeast, wheat, gluten, soy, dairy products, artificial coloring, artificial flavoring, or preservatives.

Recommendations: Take 1 or 2 capsules three times daily between meals, or as recommended by your healthcare professional.

If pregnant, nursing, or taking prescription drugs, consult your healthcare professional prior to use.

Integrative Therapeutics	Natural Partners	Emerson Ecologics
60 CT - 146003	60 CT - TY0057	60 CT - DET09
120 CT - 146004	120 CT - TY0056	120 CT - DET08

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*THIS STATEMENT HAS NOT BEEN EVALUATED BY THE FOOD AND DRUG ADMINISTRATION. THIS PRODUCT IS NOT INTENDED TO DIAGNOSE, TREAT, CURE, OR PREVENT ANY DISEASE.