



## DETOX ANTIOX™

SUPPORT FOR THE DETOXIFICATION OF HEAVY METALS AND OTHER HARMFUL COMPOUNDS

60 VEGETARIAN CAPSULES | NPN80049437 | DAT060-CN

**Detox Antiox™** synergistically combines nutrients, herbal extracts and other compounds that have positive effects on the body's detoxification processes. The ingredients in this product were selected for their ability to combat free radicals and help detoxify harmful substances including heavy metals. This formula contains multiple nutrients known to raise glutathione levels, making it helpful for supporting phase II liver detoxification. Detox Antiox™ is also designed to aid in the production of metallothionein, a cysteine-rich protein with potent antioxidant effects and heavy metal binding capacity, including to cadmium and copper.<sup>1,2</sup> Metallothionein has even greater free radical quenching capacity than glutathione for certain specific free radicals, such as the hydroxyl radical.<sup>1</sup>

Taken as a whole, the ingredients in Detox Antiox™ have specific roles in the mitigation of heavy metal toxicity and can improve the mobilization and excretion of harmful compounds when used in conjunction with standard chelating agents.<sup>3</sup>

### FEATURES OF DETOX ANTIOX™

- **Lipoic Acid:** a sulfur-containing compound that exhibits amphipathic antioxidant properties (it is effective in both water- and lipid-based environments). This unique property allows it to quench free radicals in hydrophilic and lipophilic environments alike—cytosol, plasma membranes, serum, and lipoproteins.<sup>4,5</sup> Lipoic acid (LA) is an “antioxidant of antioxidants.” When reduced to dihydrolipoic acid (DHLA), it serves to regenerate vitamins E and C, glutathione (GSH), and coenzyme Q10.<sup>5,6</sup> Coupled together, oxidized and reduced LA have a greater redox potential than oxidized and reduced GSH, leading some researchers to refer to lipoic acid as a “universal antioxidant.”<sup>5</sup> An additional effect of LA's antioxidant capacity is its role in binding free, redox-active metals. LA has been shown to bind copper, manganese, zinc, and lead, while DHLA is effective in binding copper, zinc, lead, mercury, cadmium, and iron.<sup>5-7</sup> Lipoic acid may increase the need for biotin by lowering levels of biotin dependent enzymes; thus, this formula includes biotin as LA should always be taken with biotin.<sup>8,9</sup>
- **Selenium, Zinc:** Selenium is needed for the synthesis of at least five isoforms of glutathione peroxidase (GPx), which reduces damaging hydrogen peroxide to water.<sup>10,11</sup> Selenium is also needed for the thioredoxin reductase enzyme family, considered to be among the major antioxidant enzymes and redox regulators in mammalian cells.<sup>10</sup> Selenium has a key role in protecting against mercury toxicity.<sup>12-15</sup> Some of the toxicity symptoms associated with high mercury levels may be due to reduced availability of selenium and the resulting reduction in activity of selenium-dependent enzymes such as GPx and the deiodinase enzyme needed for conversion of T4 to T3 for proper thyroid hormone levels. An adequate supply of selenium may help mitigate the effects of mercury toxicity or possibly even reverse some of the symptoms.<sup>12,13</sup> Together with selenium, zinc (bound to methionine) aids in synthesis of metallothionein.
- **Manganese:** a required cofactor for mitochondrial superoxide dismutase (MnSOD), a key antioxidant enzyme for protecting fragile fatty acids in mitochondrial membranes against lipid peroxidation.<sup>17,18</sup> Manganese is also a cofactor for the arginase enzyme in the urea cycle, so it plays a role in proper dispensation of normal metabolic wastes.<sup>19</sup> The body's concentration of manganese is especially high in mitochondria and is also high in organs that have a large role in detoxification, including the liver and kidneys.<sup>20</sup>
- **Molybdenum:** an essential cofactor in multiple enzymes involved in detoxification, such as sulfite oxidase, xanthine oxidase and aldehyde oxidase. Among other roles, these are responsible for normal breakdown of purines and sulfur-containing amino acids, oxidizing harmful sulfites to sulfates, and metabolism of pharmaceutical drugs and xenobiotics.<sup>21,22</sup> Deficiency in sulfite oxidase may result from inadequate molybdenum, potentially leading to sulfite/chemical sensitivity and alterations in CYP450 activities that affect metabolism of various drugs.<sup>23-25</sup>

- **Turmeric and Green Tea Extract:** inducers of various CYP450 enzymes to support effective detoxification. These compounds also induce the Nrf2 pathway (nuclear factor erythroid 2-related factor 2),<sup>16</sup> “an emerging regulator of cellular resistance to oxidants.”<sup>26</sup> “Nrf2-linked pathways are involved in protective mechanisms against oxidative stress by regulating antioxidant and phase II detoxifying genes.”<sup>27</sup> Activation of Nrf2 appears to protect against chemically-induced apoptosis and promote mitochondrial biogenesis.<sup>26</sup>
- **Vitamin E Isomers:** a fat-soluble antioxidant that protects cell membranes and lipoproteins (including LDL) from oxidative damage.<sup>28</sup> Human and animal studies indicate that vitamin E supplementation helps prevent oxidation of GSH and increases its levels in tissues.<sup>29</sup> The vitamin E isomers in this product are provided as patented DeltaGold® delta and gamma tocotrienols.
- **Vitamin C:** a potent free radical scavenger biochemically intertwined with GSH. Glutathione recycles oxidized dehydroascorbate back to ascorbate and GSH deficiency is associated with low tissue ascorbate levels. Vitamin C supplementation has been shown to increase GSH levels in healthy adults, and the combination of vitamin C with vitamin E may have additive effects.<sup>28</sup> This combination significantly increased activity of superoxide dismutase and GPx while decreasing malondialdehyde (a marker for lipid peroxidation) in patients with cardiovascular disease.<sup>30</sup>
- **Grape Seed Extract:** a more potent antioxidant than vitamin C or E.<sup>31</sup> Grape seed extract (GSE) contains the antioxidant compound oligomeric proanthocyanidin (OPC), which has been shown to have free radical scavenging properties and to inhibit lipid peroxidation.<sup>32</sup> Animal studies show that GSE protects against cadmium-induced organ and tissue damage partly through Nrf2-related mechanisms<sup>33-35</sup> and also protects against hepatotoxicity induced by perfluorooctanoic acid (PFOA),<sup>36</sup> an environmental contaminant known to be a carcinogen and endocrine disruptor.<sup>37</sup>
- **N-Acetyl-L-Cysteine (NAC) and L-Leucine:** The availability of cysteine is the rate-limiting factor for GSH resynthesis.<sup>38</sup> NAC is a primary source of cysteine and a precursor to GSH, and NAC itself is an antioxidant, with the sulfhydryl group (-SH) within the NAC molecule directly scavenging reactive oxygen species.<sup>39</sup> (Lipoic acid also provides cysteine.) NAC plays a major role in healthy detoxification. Leucine, when taken with cysteine, prevents mercury from crossing the blood-brain barrier (BBB) and may also help protect the central nervous system from toxicity of other heavy metals.<sup>40</sup>

#### DETOX ANTIOX™ MAY BE BENEFICIAL FOR:

- Boosting detoxification pathways
- Protection against heavy metal absorption
- Supporting the safe and natural elimination of toxins and heavy metals
- Increasing antioxidant activity
- Providing precursors and cofactors for detoxification nutrients
- Supporting healthy levels of glutathione

#### Medicinal Ingredients (per capsule):

Vitamin C (Ascorbic acid) .....	250 mg
N-Acetyl-Cysteine.....	125 mg
Leucine.....	75 mg
Grape Seed Extract ( <i>Vitis vinifera</i> -Seed) (95% Oligomeric proanthocyanidins 50:1) .....	25 mg
Green tea extract ( <i>Camellia sinensis</i> -Leaf) (98% Polyphenols, 45% Epigallocatechin 3-gallate 20:1) .....	25 mg
Turmeric ( <i>Curcuma longa</i> -Root) (95% Curcuminoids).....	25 mg
Alpha Lipoic Acid.....	15 mg
Tocotrienols.....	15 mg
Zinc (Zinc bisglycinate).....	7.5 mg
Manganese (Manganese bisglycinate).....	1.5 mg
Biotin.....	75 mcg
Molybdenum (Molybdenum bisglycinate).....	50 mcg
Selenium (Selenomethionine) .....	50 mcg

**Non-Medicinal Ingredients:** Microcrystalline cellulose, magnesium stearate (vegetable source), silicon dioxide. **Recommended Dose:** Adults: Take two capsules per day with a meal, or as directed by your health care practitioner. Take a few hours before or after taking other medications. Consult a health care practitioner for use beyond 12 weeks.

Dosing recommendations are given for typical use based on an average 150 pound healthy adult. Healthcare practitioners are encouraged to use clinical judgement with case-specific dosing based on intended goals, subject body weight, medical history, and concomitant medication and supplement usage. Any product containing botanical substances has the potential for causing individual sensitivities. Individual monitoring, including liver function tests, may be appropriate.

#### REFERENCES

For a list of references cited in this document, please visit: <https://www.designsforhealth.com/techsheet-references/detox-antiox-references.pdf>