Heavy metal-induced toxicity resulting from chronic exposure to heavy metals is quickly becoming a serious health problem around the globe. Conservative estimates state that upwards of 25% of the U.S. population (1 out of every 4 Americans) suffer to some degree from heavy metal poisoning. Contamination of the air, soil, water and food supply with heavy metals results in the accumulation of toxic heavy metals in the body. The heavy metals most frequently encountered are aluminum, arsenic, cadmium, lead, mercury and nickel. Even at minute levels, these toxic metals can have detrimental effects on virtually every system of the body, with the integrity of the cardiovascular, gastrointestinal, neurological and urological systems being especially vulnerable to heavy metal-induced impairment. Symptoms of heavy metal toxicity include fatigue, immune system dysfunction, behavior and mood disturbances, musculoskeletal complaints, and gastrointestinal (GI) and neurological problems, as well as anemia, high blood pressure, kidney and liver dysfunction, and endocrine disorders.

Fortunately, research shows that a variety of nutritional supplements can help reduce and even inhibit the adverse effects of heavy metals, as well as aid in their elimination from the body.¹ ³

Heavy Metal Detox is designed to facilitate the elimination of toxic heavy metals from the body, while also protecting cells against the adverse effects of heavy metal exposure. Heavy Metal Detox also supports liver function and healthy elimination in order to minimize reuptake of heavy metals from the bowels. In addition, Heavy Metal Detox contains a blend of ingredients that provide essential vitamins, minerals and nutrients necessary for cellular detoxification and repair. Heavy Metal Detox contains:

**Vitamin B₆** (pyridoxal-5-phosphate) - Vitamin B₆ has been shown to inhibit lead uptake, as well as reduce lead intoxication and cytotoxicity (toxicity to cells) by mobilizing lead deposits in tissues and enhancing its excretion through the urine. In addition, vitamin B₆ is a key component in the formation of neurotransmitters such as dopamine and serotonin, and is therefore essential for regulating mood and behavior. Vitamin B₆ also increases the bioavailability of magnesium. Deficiency of vitamin B₆ leads to impaired immune responses, and has recently been linked to multiple chemical sensitivity (MCS)—vitamin B₆ deficiency can cause low taurine levels, which in turn, can result in the development of extreme sensitivities to alcohols, aldehydes, ammonia, chlorine, chlorite (bleach) and solvents. Vitamin B₆ is converted into pyridoxal-5-phosphate (PLP), the metabolically active form of vitamin B₆, in the liver. PLP is the primary circulating form of vitamin B₆ exported from the liver and is considered to be the most relevant diagnostic indicator of functional vitamin B₆ status. Research has shown that plasma PLP levels are significantly lower in a majority of patients with impaired liver function, which indicates that a poorly functioning liver may not be able to adequately convert inactive forms of vitamin B₆ (such as pyridoxine HCl) into PLP.² ⁴ ⁸

**Cilantro** is an herb that has demonstrated an affinity for mercury. Cilantro has been shown to successfully eliminate mercury deposits in internal organs, as well as accelerate the excretion of aluminum, lead and mercury from the body through the urine. In addition, cilantro significantly decreased both lead deposition in the femur and severe lead-induced injury in the kidneys of mice. The researchers concluded that cilantro’s suppressive activity on lead deposition most likely resulted from the chelation of lead by some substances contained in cilantro that are yet unknown. Various nutrients that have been identified in cilantro include beta-carotene, riboflavin, thiamine, niacin, vitamin C, and the minerals calcium, copper, iron, magnesium, manganese, phosphorus and potassium.¹ ⁹ ¹²

**Sodium alginate** is a water-absorbing, gelatinous substance derived from brown seaweed, has been shown to inhibit toxic heavy metal uptake in the bowels. Sodium alginate binds heavy metals and other toxins in the gastrointestinal tract and exerts a bulk laxative action that draws these substances out of the body in the feces. Research indicates that sodium alginate exhibits a high specificity for the binding of radioactive strontium-90, as well as cadmium, lead, mercury and nickel.¹ ² ¹² ²⁰

**Apple pectin**, a source of water-soluble, dietary fiber, helps soften stools and increases bowel transit time, thus minimizing reuptake of heavy metals from the bowels. Fecal elimination is especially important with respect to mercury. Apple pectin binds heavy metals, as well as chemical toxins, in the intestines and expels them from the body. One study has shown that apple pectin exhibits a high affinity for cobalt ions—exposure to cobalt-containing materials may cause lung cancer in humans.¹ ³ ²¹ ²³

**N-Acetyl-L-cysteine** (NAC) appears to have some clinical benefit as a chelating agent in the treatment of acute heavy metal poisoning. NAC has been shown to promote the elimination of toxic metals, as well as protect the liver and kidneys against damage from proinflammatory immune factors that are released by the liver in response to heavy metal exposure. In particular, NAC has been used to effectively reduce the body burden of mercury. In fact, oral...
administration of NAC produced a profound acceleration of urinary methylmercury excretion in mice compared to the control group. Methylmercury is a ubiquitous (being everywhere) environmental pollutant and potent neurotoxin. Furthermore, NAC has also been shown to protect animals from asbestos-induced oxidative damage and the resulting depletion of glutathione (the most important antioxidant for liver detoxification) levels. Asbestos is an extremely toxic and carcinogenic substance.\textsuperscript{3,24-29}

**Magnesium** (citrate) - Magnesium protects against heavy metal-induced toxicity and has been shown to be a competitive antagonist (a substance that blocks or nullifies the actions of another) of the toxicological effects of nickel. However, a deficiency of magnesium can actually increase heavy metal toxicity. Many heavy metal-burdened individuals exhibit increased urinary magnesium excretion, and there appears to be an association between magnesium deficiency and increased sensitivity in patients with multiple chemical sensitivity (MCS). In addition, low dietary magnesium, coupled with calcium deficiency, may contribute to aluminum-induced degenerative nervous disease. Furthermore, magnesium deficiency results in decreased amounts of cytochrome P450, which is essential to the proper functioning of phase I detoxification—one of 2 distinct phases of detoxification that takes place in the liver, by which toxins are chemically transformed into progressively more water-soluble substances that can be more readily excreted. Magnesium citrate has been shown to be more soluble and more bioavailable, with respects to gastrointestinal absorbability, than magnesium oxide.\textsuperscript{1,3,30-33}

**I-Methionine**, a sulfur-containing amino acid, acts as a powerful detoxifier of heavy metals, including lead and cadmium. Methionine also demonstrates antioxidant properties and protective effects against alcohol. Elimination of fat-soluble compounds, particularly heavy metals like lead and mercury, requires adequate levels of glutathione, which in turn requires sufficient levels of methionine—an essential component for glutathione synthesis. As levels of toxic compounds in the body increase, more methionine is utilized for glutathione synthesis. Researchers attribute much of the beneficial effect of methionine on heavy metal toxicity to its ability to increase the bioavailability of glutathione. Methionine deficiency negatively impacts detoxification by reducing hepatic (liver) and intestinal mixed function oxidase (MFO) enzyme activity. Low methionine intake also hampers selenium metabolism—selenium reduces the toxicity of lead and facilitates the excretion of cadmium and mercury from the liver. Adequate supplementation of vitamin B6 is necessary when supplementing with methionine.\textsuperscript{1,2,34-38}

**Kelp** contains algin, a non-digestible dietary fiber that binds heavy metals and radioactive particles in the intestines and draws these substances out of the body. Kelp also contains fucoidan, a polysaccharide that has demonstrated inhibitory effects on the absorption of heavy metals. Animal and in vitro research shows that fucoidan exhibits antiproliferative and antitumor activity, with preliminary results indicating that fucoidan may serve as a potent antitumor agent in cancer therapy. From a nutritional standpoint, kelp provides a high concentration of minerals (calcium, magnesium, iodine, iron and potassium), vitamins, essential amino acids, protein, and dietary fiber. In fact, research indicates that algal dietary fiber may provide important functional activities, including antioxidant, anticoagulant, antimutagenic and antitumor effects, as well as the ability to alter lipid (fat) metabolism.\textsuperscript{14,16,39-43}

**Alpha lipoic acid** (ALA) has been shown to protect cells against heavy metal-induced toxicity. Animal research has demonstrated that ALA significantly decreases cadmium-induced liver damage, while both in vitro and in vivo studies have found ALA to be effective in chelating mercury from renal (kidney) tissue. ALA also dramatically enhanced biliary (gallbladder) excretion of inorganic mercury in rats. Furthermore, ALA has been shown to be highly effective in reducing lead-induced oxidative stress, and significantly increased the survival of lead-exposed hamster ovary cells in vitro, suggesting that ALA may be beneficial in the therapeutic intervention of lead poisoning.\textsuperscript{44-50}

References:

\textsuperscript{1}Bock MD, S. "Diagnosis and Treatment of Heavy Metal Toxicity." *International Journal of Integrative Medicine*; 1999, 1(6):7-12.


\textsuperscript{8}Vitamin B6 (Pyridoxine; Pyridoxal 5'-Phosphate)." *Alternative Medicine Review*; 2001, 6(1):87-92.

\textsuperscript{9}Omura, Y., et. al. "Significant mercury deposits in internal organs following the removal of dental amalgam, & development of pre-cancer on the gingiva and the sides of the tongue and their represented organs as a result of inadvertent exposure to strong curing light (used to solidify synthetic dental filling material) & effective treatment: a clinical case report, along with organ representation areas for each tooth." *Acupuncture & Electrotherapeutics Research*; 1996, 21(2):133-160.