Detoxify For Life

By John Cline, MD, BSC, CCFP

Introduction

The process of detoxification involves the mobilization, biotransformation and elimination of toxicants of exogenous and endogenous origin. Detoxification is a vital cellular task that if lacking will lead to early morbidity and mortality. Our cells expend large amounts of energy to ensure that detoxification pathways continue to do their work. A variety of macro and micronutrients are required on a continuous basis in order to construct the multitude of enzymes for the various oxidation, reduction, hydrolysis, and conjugation pathways – as well as the provision of enzymatic cofactors, phytochemical antioxidants and fiber.[1] Patients often request a 'detoxification program' and are surprised to learn that it is not a program that is required but a detoxification lifestyle that needs to be adopted. Components of this lifestyle include: avoidance of environmental toxicants (such as heavy metals, persistent organic pollutants and electromagnetic radiation), mobilization/elimination of toxicants via loss of excessive fat, and use of saunas, chelation therapy and exercise[2], optimal gastrointestinal health[3], excellent nutrition and hydration[1], attention to stress/resilience and relational health , as well as adequate sleep/relaxation.[4] It is important for health practitioners to model the detoxification lifestyle which then encourages patients to adopt similar health practices.

Detoxification/ Biotransformation Pathways

The process of detoxification involves multiple steps in the biotransformation of primarily non-polar, lipid-soluble toxicants into polar, water-soluble and excretable derivatives – as originally postulated by Roger Williams in his 1947 monograph *Detoxification Mechanisms.* Since then a large body of literature has been published[5] leading to the current understanding of how detoxification can be utilized in the prevention and treatment of disease in clinical practice. Figure 1 is an important tool that summarizes the Phase I and Phase II detoxification/biotransformation pathways which allows a conceptual framework for clinician and patient. Toxicants originate from exogenous sources such as drugs (pharmaceutical, recreational), heavy metals, chemicals (herbicides, pesticides, insecticides, food additives, household cleaners and other pollutants), microbials and so on. Toxicants also originate from endogenous sources such as bacterial endotoxins and end products of metabolism[1]. It is important to realize that steroid hormones are also metabolized through these pathways.

Phase I Detoxification Pathways

The majority of the detoxification/biotransformation processes occur in the liver and the enterocytes which line the intestine. They are also found in many other organs such as the brain, lungs, kidneys and skin. The Phase I system is comprised of at least 57 pathways known as the cytochrome (CYP) P450 family of mixed function oxidases.[6] Nine of the most commonly utilized CYP pathways are: 1A1, 1B1, 2A6, 2B6, 2C9, 2C19, 2D6, 2E1 and 3A4. In Phase I, toxicants are transformed to more polar, less lipid-soluble forms through the processes of oxidation, reduction or hydrolysis reactions. In order for the P450 enzymes to be present and conformationally active, one must consume high-quality, bioavailable protein as well as a host of phytonutrients, botanicals, minerals, fats and carbohydrates.[1] These are required for epigenetic modification of transcription and production of the various CYP enzymes; enzymatic cofactors, production of energy and so on. It is understood that after going through the Phase I processes, the activated toxicants are often more toxic than their parent compounds. If these activated intermediate metabolites are not further metabolized via the Phase II conjugation pathways, they may cause damage to the cells by covalently binding to various proteins, lipids and nucleic acids within the cells. Reactive oxygen species are also a byproduct of the Phase I activity. Therefore, adequate antioxidant nutrient protection is required to quench the propogation of free radical activity with a number of plant derivatives[7] including: the carotenes (lycopene, beta-carotene, lutein, zeaxanthin, astaxanthin), ascorbic acid, tocopherols, thiols, bioflavonoids, silymarin, pycnogenol, selenium, copper, zinc and manganese (Figure 1). Other nutrients include: N-acetylcysteine, alpha lipoic acid, polyphenols (pomegranate, green tea, raspberries etc.) and curcumin.[8]

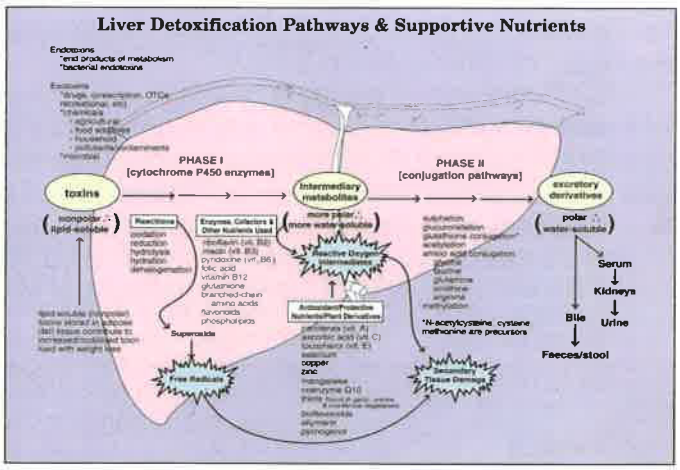

Figure 1 Liver detoxification pathways and supportive nutrients (used with permission from the Institute for Functional Medicine.)

Phase II Detoxification

The majority of intermediate metabolites will progress on to the Phase II conjugation pathways where they are joined to constituents such as glucuronide, sulfate, glutathione, various amino acids (taurine, glycine, arginine, glutamine, serine and proline), acetyl and methyl groups. The biotransformed polar and water-soluble toxicants are

then excreted via the bile and feces or via the serum, kidneys and urine. As the various constituents of conjugation are bound to the toxicants, there is potential for them to become depleted unless there is an ongoing dietary supply.1 Therefore, excellent nutrition is imperative for a detoxification lifestyle.

Once conjugated toxicants exit the liver via the bile, they are excreted into the feces. One component of bile is the bile acids which are necessary in the emulsification and solubilization of dietary fats. In the distal small bowel 90-95% of the bile acids are reabsorbed and returned to the liver, thus recycling and conserving them. This cycling of bile acids occurs approximately twelve times each day and is known as the enterohepatic circulation.[9] Microbes found in the intestinal lumen contain enzymes (such as beta-glucuronidase) which can cleave the conjugated toxicants, reactivating them, and allowing them to reabsorb into the portal system ending up once again in the liver. The enterophepatic circulation allows essential compounds such as estrogen and vitamin D to be conserved.[10,11], There is some evidence in animal models that the alginate chlorella, has the potential to inhibit the absorption of certain heavy metals and organic pollutants across the intestinal mucosa, decreasing the enterohepatic circulation of these toxicants.[12,13]

"Let food be thy medicine" as taught to us by Dr. Hippocrites is as true today as it was in 400 BC. Using a focus on food to support the highly complex processes of detoxification and biotransformation is the wise approach. If we consider that an apple contains at least 700 different phytochemical compounds – it is better to eat the apple as one of a variety of foods than to try and replicate with single nutritional supplements.[14]

The first goal in the use of nutrition in detoxification is to remove from the diet foods and beverages, as well as food allergens that have potential to increase toxicity in the body. Examples include removing foods containing: petrochemical residues from farming practices, polycyclic aromatic hydrocarbons such as charbroiled meat, trans fats; and water contaminated with metals and chemicals. Next, it is important to add to the diet foods that are clean which nourish the organs of detoxification providing substrates and cofactors for optimal detoxification, as well as foods that positively modify genetic expression and cell signaling.[15] A most useful therapeutic tool developed by the Institute for Functional Medicine is the Comprehensive Elimination Diet[16] which helps patients become their own medical detectives in discovering the foods or beverages that cause their body to react.

Detoxification Lifestyle Strategies

Once the foundation of good nutrition has been established then other strategies are usually more effective including the optimization of gastrointestinal health, the mobilization and elimination of toxicants such as heavy metals, persistent organic pollutants via the use of chelation therapy, saunas, exercise, weight loss and so on. An important aspect of the detoxification lifestyle is the elimination of abnormal electromagnetic fields and restoration of balance in the body's innate electromagnetic grid also known as the "living matrix".[17] Highly effective tools have been developed to assist the body in balancing the living matrix such as Biofeedback combined with Focused Field Stimulation.[18]

Case History

This case history is a compilation of two cases supervised by Dr. John Cline MD and utilizes the Functional Medicine approach to critical thinking looking at antecedent, triggering and mediating factors. A 58-year-old G2P1A1 married woman presented with fatigue, frequent respiratory infections, nightmares with sleep disturbance for many years, anxiety, sensitivities to fumes and fragrances, symptoms of allergic rhinitis, as well as paradoxical reactions to many medications. She had been a vegetarian for several decades. Taking an environmental history revealed that she had grown up in an old house that had lead-based paint and lead water pipes. Many mercury dental amalgams were placed in her teeth as a child. Completing a degree in art/photography exposed her to many kinds of paints (containing organic chemicals and metals such as lead, cadmium, mercury, thallium etc.). Working in the dark rooms for photographic development exposed her to various chemicals in an enclosed space.

She and her husband had renovated several old houses which would have exposed her to lead-based paint, solvents, glues, lacquers, and possibly asbestos. They built a new house seven years before our meeting. There were four cordless telephones as well as wireless internet in the house. She used a cell phone several times per day holding it to her head. She noticed that with prolonged cell phone conversations she would experience a burning sensation on the same side of her head. On examination she appeared tired, nervous and her skin was dry. BP = 102/78 with pulse 72 BPM and regular. Nasal turbinates showed signs of chronic inflammation. Examination was otherwise unremarkable. Her lab work revealed normal CBC with suboptimal B12 = 328 pmol/l (N = 150 – 650 pmol/l), 25 (OH) Vitamin D suboptimal = 74 nmol/l (N = 75 – 150 nmol/l), low IgA = 0.6 g/l (N = 0.78 – 3.58 g/l) and normal Tissue Transglutaminase IgA Antibody (TTG) = < 5 units (N = < 20 units). The normal appearing TTG could have been falsely low because of the low IgA. Skin testing for inhalant allergies revealed moderate reactions to house dust mite, dog and horse danders and broom. She was advised to place dust mite covers on her pillows and mattress. She was placed on a therapeutic oral dose of pharmaceutical-grade fish oil, Vitamin D3, sublingual methylcobalamin and a B-complex.

Genomic analysis of her phase I and phase II biotransformation/ detoxification pathways revealed single nucleotide polymorphisms (SNPs) present in phase I CYP1A1, CYP1B1 and CYP3A4 pathways.

Analysis of the phase II pathways revealed SNPs present in two of the NAT2 (N-Acetyl Transferase) slow metabolizer pathways as well as the fast metabolizer pathway. Of great significance was the complete absence of GSTM1 (Glutathione S-Transferase) which is found in the liver and kidneys. This pathway is one of the major pathways for the biotransformation/detoxification of many environmental toxicants such as solvents, herbicides, fungicides, lipid peroxides and heavy metals (mercury, cadmium lead, etc.). It was suggested that she minimize exposure to the various chemicals/metals in her environment such as cigarette smoke, herbicides, fungicides, insecticides, industrial solvents, polycyclic aromatic hydrocarbons (cigarette smoke, vehicle exhaust etc), polychlorinated biphenyls, and xenoestrogens such as organochlorines etc. Dietary advice was given in regards to the genetic SNPs that were discovered. This included eating a diet rich in antioxidants (colorful fruits and vegetables), emphasizing the cruciferous vegetables (broccoli, Brussels sprouts, cauliflower, watercress, cabbage and kale), garlic, onions, and berries. She was advised to avoid eating charbroiled, fried foods, and red meat. She was advised to take nutritional supplements to redirect metabolism away from the 4-hydroxylation of estrogens with nutritional supplements such as diindoylmethane (DIM), indole 3-carbinol (I3C), fish oils, and rosemary. She was also encouraged to include glutathione precursors and cofactors such as methionine, N-acetylcysteine, L-glutamine, glycine, magnesium and pyridoxal-5-phosphate as well as the use of alpha-lipoic acid, milk thistle, and taurine.

She was placed on a comprehensive elimination diet and discovered that she had significant reactions to gluten and dairy. Therefore, these were eliminated from her diet. She tested her home for dirty electricity using a Graham Stetzer microsurge meter and found fields in the order of 600 – 1000 dV/dt (N = <25 dV/dt) and placed a number of Graham Stetzer filters in the plug-ins throughout her home. She exchanged her cordless telephones for land-line telephones and obtained cable internet. She observed an immediate cessation of her chronic nightmares. She was advised to avoid placing cellular telephones near her head. She went through a heavy metal detoxification program which involved dietary measures, nutritional supplements, dental work (replacing her mercury amalgams with BPA-free composites) and chelation therapy.

The treatment program resulted in renewed energy, cessation of nightmares with better quality sleep, no further anxiety, marked decrease in frequency of respiratory infections, improvement in allergic rhinitis symptoms, and diminished reactions to fumes and fragrances.

In summary, components of a detoxification lifestyle have been reviewed emphasizing the 'food as medicine' foundational approach recognizing that an important aspect of the detoxification lifestyle is the elimination of abnormal electromagnetic fields and restoration of balance in the body's innate electromagnetic grid also known as the living matrix. A case study illustrating the detoxification lifestyle is presented.

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About the Author

Medical director Dr. John C. Cline is a license medical doctor in BC and certified by the International Board of Clinical Metal Toxicology. Dr. Cline is also medical director of the Oceanside Functional Medicine Research Institute. Dr. Cline is the author of the book 'Detoxify For Life,' a comprehensive analysis of the many toxic substances that permeate our lives. To review and purchase this book online, please visit the Detoxify For Life website. Dr. Cline holds degrees in biochemistry (1982) from the University of Calgary, where he graduated with a Medical Degree in 1985. He then completed two years of postgraduate residency in family practice at the Holy Cross Hospital in Calgary and was successful certified by the Canadian College of Family Physicians in 1997.

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