

Study Guide with Test Questions

Herbal ABC's: The Foundation of Herbal Medicine

(2018) by Dr. Sharol Marie Tilgner

CLASS: G350B – Part II (Cardiovascular System thru Urinary System)

Cardiovascular System Herbs

1. _____ Cardiovascular dysfunction often begins in the thin layer of _____ cells that line the inside chambers of the heart, valves, and blood vessels.
 - a. Heart
 - b. Lungs
 - c. Endothelial
 - d. Arteries
 2. _____ Most cardiovascular disease risk factors increase oxidative stress. Production of what important protective factor is imperative for cardiovascular health?
 - a. Nitric oxide
 - b. Cortisol
 - c. Superoxide
 - d. Glutathione
 3. _____ Current research suggests endothelial cells renew themselves at approximately what rate each year?
 - a. 25%
 - b. 15%
 - c. 10%
 - d. 5%
- Note:** “This means you can’t expect to see sudden changes in the endothelial layer from changes in lifestyle and use of herbs and nutrients. However, you can stop the damage and begin the repair. Over time the changes will become evident.”
4. _____ The use of statin drugs can cause a host of unpleasant and serious side effects, as they block not only the synthesis of cholesterol but also what key nutrient needed for mitochondrial energy production?
 - a. Glutathione
 - b. CoQ10
 - c. Vitamin C
 - d. Vitamin D
 5. _____ Herbs used externally to cause vasodilation are called...
 - a. Rubefacients
 - b. Hypotensives
 - c. Vascular tonics
 - d. Anti-inflammatories

The liver synthesizes the majority of CoQ10 needed for the human body. Coenzyme Q10 is required in mitochondrial respiration and deficiencies may result in several **neurologic and myopathic (muscle) syndromes**. Statin drugs used to decrease cholesterol levels are hydroxyl-methylglutaryl coenzyme A reductase inhibitors. Statins interfere with the production of mevalonic acid, which is a precursor in the synthesis of coenzyme Q10, and they **“have been shown to**

affect protein synthesis and modification at multiple levels...Statin-induced myopathy may also be associated with mitochondrial dysfunction". - <https://www.unmc.edu>
"Thus, randomized controlled clinical trials have shown supplementation with **CoQ10 or CoQ10 plus selenium** reduces mortality by approximately 50% in patients with cardiovascular disease, or in the normal elderly population, respectively. Similarly, CoQ10 supplementation improves glycemic control and vascular dysfunction in type II diabetes, improves renal function in patients with chronic kidney disease, and reduces liver inflammation in patients with non-alcoholic fatty liver disease." - <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6406788/>

Musculoskeletal System Herbs

6. _____ True or False: Bones contain more dense, compact tissue if they are under frequent stress, such as from weight and resistance type exercise.
7. _____ One of the things that cushions joints and reduces friction where the bones come together is:
 - a. Water
 - b. Adipose tissue
 - c. Cartilage
 - d. Muscle
8. _____ True or False: Cartilage is quick to heal following injury due to the abundance of nourishing capillaries.
9. _____ Skeletal muscles are attached to the bone by:
 - a. Ligaments
 - b. Cartilage
 - c. Joints
 - d. Tendons
10. _____ Which of the following might be sign(s) of a muscle disorder?
 - a. Weakness
 - b. Twitching
 - c. Cramps
 - d. All of the above
11. _____ What cooling, antispasmodic herb contains trace amounts of two neurohormones (melatonin & serotonin) in its leaves and stem?
 - a. Chamomile
 - b. Skullcap
 - c. Lobelia
 - d. Cramp Bark

Bone & Muscle Nutritional Points:

- General agreement exists that diets **moderate in protein (1.0-1.5 g/kg)** are associated with normal calcium metabolism and that adequate protein is essential for developing and maintaining healthy skeletal tissue and muscle mass and function.
- Carbonated beverages, such as soft drinks, is associated with significant decreases in bone mineral density in both males and females. Negative effects of carbonated soft drinks on bone have been linked primarily with the **caffeine and sugar** content found in these drinks.
- Both phosphorus and vitamin D enhance calcium uptake. Phosphorus intake is a critical factor for promoting the incorporation of absorbed calcium in bone, but excessive phosphorus

can be detrimental to bone metabolism. As such, a **calcium-to-phosphorus ratio of 2:1** is recommended for healthy bone production.

- Similar to calcium, the benefits of adequate vitamin D intake reach beyond the skeleton. Vitamin D deficiency increases the risk of autoimmune diseases and non-skeletal chronic diseases and can also have a profound effect on human immunity, inflammation, and muscle function. Most vitamin D experts agree that the current recommended values are insufficient for optimal health. Recommendations to help achieve adequate vitamin D status include regular sun exposure and/or supplementation with **1000 to 2000 IU of vitamin D3 per day**.
- Complex carbohydrates, such as in **fruits and vegetables**, increase calcium absorption and neutralize metabolic acid loads with their substantial **potassium** content. Many fruits and vegetables contain nondigestible carbohydrates, such as inulin-type fructans.
- **Inulins are a prebiotic** compound consisting of indigestible fiber that stimulates the growth and activity of small chain fatty acid (SCFA) producing **bacteria**. “In addition, **inulin** has been demonstrated to increase glucose sensitivity, decrease blood cholesterol and oxidative stress, and prevent neurodegeneration”. - www.ncbi.nlm.nih.gov/pmc/articles/PMC6713395
- **Large increases in calcium absorption have been noted with the addition of dietary inulins** in young adults (58% increase in calcium absorption in response to 40 g/d of inulin after 24 d) as well as in postmenopausal women (42% increase after consuming 8 g/d of inulins for 3 months).” - www.ncbi.nlm.nih.gov/pmc/articles/PMC3445243.
- Food and herbal sources of inulins include beets, leeks, asparagus, onions, garlic, apples, bananas, barley, flax seeds, oats, dandelion greens, Jerusalem artichoke (“earth apple”), burdock root, dandelion root, elecampane, chicory root, and more.



Inulin was named after Elecampane (*Inula helenium*). Elecampane root is 40-50% inulin. Inulins will dissolve in hot water, making them available in gentle infusions. However, the inulin in burdock roots are resistant to extraction, a gentle decoction works best. Burdock root is mild but powerful and may be consumed on a regular basis. Tinctures, hydroethanolic extracts, contain very little inulin.

Bone & Muscle: Calcium, Magnesium, Potassium & Vitamin D

Clinical and sub-clinical levels of calcium, potassium, magnesium, and ‘vitamin’ D are associated with bone pain, muscle pain, and muscle weakness. Balancing the minerals is necessary. Studies indicate that high levels of calcium without an adequate vitamin D status **triggers muscle pain**. Increasing calcium also requires increasing magnesium.

Signs & Symptoms of Low Calcium:

- Muscle aches, cramps, and spasms are the earliest signs of a calcium deficiency. People tend to feel pain in the thighs and arms, particularly the underarms.
- Severe or long-term calcium deficiency can cause numbness and tingling in the hands, arms, feet, legs, and around the mouth. Low calcium can lead to fatigue, lightheadedness, dizziness, lack of focus, forgetfulness, and confusion.
- Chronic calcium deficiency can cause the skin to become dry and itchy, and researchers have linked hypocalcemia to eczema and psoriasis. Nails can become dry and broken (brittle nails).

- Calcium deficiency can lead to osteopenia and osteoporosis. The bones store calcium but require high levels to stay strong. When overall levels of calcium are low, the body can divert it from the bones and teeth. It takes years for bones to lose their density, and a calcium deficiency may take as long to cause serious problems.

Magnesium

More than 99% of magnesium in the body is intracellular leaving only 1% in serum and red blood cells. **The muscles and bones contain 90% of total body magnesium.** Magnesium is the second most common intracellular cation (potassium being the first). Magnesium is necessary for the functioning of over 300 enzymes, maintains ionic gradients (keeps intracellular sodium and calcium low and potassium high), and maintains DNA, RNA and protein synthesis.

Blood tests for magnesium are basically useless and result in undiagnosed magnesium deficiency as only 1% of magnesium is found in the blood. Magnesium deficiency has been found in 84% of postmenopausal women with osteoporosis diagnosed by low magnesium trabecular bone content and Thoren's magnesium load test.

"Various studies have shown that at least 300 mg magnesium must be supplemented to establish significantly increased serum magnesium concentrations...**In other words, most people need an additional 300 mg of magnesium per day** in order to lower their risk of developing numerous chronic diseases. So while the recommended daily allowance for magnesium (between 300 and 420 mg/day for most people) may prevent frank magnesium deficiency, it is unlikely to provide optimal health and longevity, which should be the ultimate goal." - www.ncbi.nlm.nih.gov/pmc/articles/PMC5786912/

Increased calcium and phosphorus intake also increase magnesium requirements and may worsen or precipitate magnesium deficiency. The increase in dietary phosphate has come from phosphoric acid found in soft drinks and phosphate additives found in many food items, especially processed meats.

Potassium

Potassium is the third most abundant mineral in the human body and one of seven essential macrominerals needed to support multiple body processes. Nearly all potassium in the human body is found in cells, with **80% in muscle cells and 20% in bones, liver, and red blood cells.**

Weakness and fatigue are often the first signs of potassium deficiency. Potassium helps **regulate muscle contractions**, so when levels are low, the muscles produce weaker contractions. Low potassium can cause muscle cramps (high potassium also causes cramps), muscle spasms, tingling or numbness, digestive issues, heart palpitations (high potassium also causes palpitations), excessive urine or thirst, and an increase in blood pressure.

Nervous System Herbs

12. _____ Of the four main types of glial cells found in the nervous system, which one is found in the peripheral nervous system?

- a. Astrocytes
- b. Schwann cells
- c. Microglia
- d. Oligodendrocytes

13. _____ Chemicals used for communication between nerve cells (neurons) are called:
- | | |
|----------------------|--------------|
| a. Neurons | c. Myelin |
| b. Neurotransmitters | d. Dendrites |
14. _____ True or False: Most nerves of the peripheral nervous system contain both sensory neurons and motor neurons.
15. _____ True or False: The autonomic nervous system is divided into two parts: the sympathetic nervous system and the parasympathetic nervous system.

The answer for #15 is what is found in your book for G350. Some text books do not include the enteric nervous system as a third division of the autonomic nervous system.

“The enteric nervous system (ENS) is composed of two ganglionated plexuses: the myenteric and the submucosal. The myenteric plexus sits in between the longitudinal and circular smooth muscle of the GI tract, while the submucosal plexus is present within the submucosa. The ENS is self-contained, functioning through local reflex activity, but often receives input from, and provides feedback to, the sympathetic nervous system and parasympathetic nervous system.”.-
www.ncbi.nlm.nih.gov/books/NBK539845/

“Until relatively recently, it was believed that a given neuron produced only a single type of neurotransmitter. There is now convincing evidence, however, that many types of neurons contain and release two or more different neurotransmitters”. -<https://www.ncbi.nlm.nih.gov/books/NBK10818/>

16. _____ True or False: Nerve cells (neurons) release only one type of neurotransmitter (chemical messenger).
17. _____ Plant substances that act on the receptors of nerve cells in a way that mirrors that of a neurotransmitter are known as _____ molecules.
- | | |
|---------------|----------------|
| a. Agonist | c. Cholinergic |
| b. Antagonist | d. Adrenergic |
18. _____ Which chemical messenger is the most common excitatory neurotransmitter in the nervous system?
- | | |
|----------------|------------------|
| a. Dopamine | c. Glutamate |
| b. Epinephrine | d. Acetylcholine |
19. _____ Which chemical messenger is the most common inhibitory neurotransmitter in the brain?
- | | |
|------------|--------------|
| a. GABA | c. Serotonin |
| b. Glycine | d. Dopamine |
20. _____ Which of the following is not a nerve-stimulating methylxanthine?
- | | |
|-----------------|----------------|
| a. Caffeine | c. Harmine |
| b. Theophylline | d. Theobromine |

21. _____ The induction of alertness and wakefulness by CBD is thought to be due to activation of neurons in the hypothalamus and dopamine receptors. Research has shown that an injection of CBD increases which neurotransmitter(s)?
- a. Norepinephrine
b. Epinephrine
c. Serotonin
d. All of the above
22. _____ What herb has been shown to play an important role in the modulation of the hypothalamic-pituitary-adrenal (HPA) axis function (a common biological alteration in people with major depression)?
- a. Rosemary
b. St. John's Wort
c. Cannabis
d. Lavender

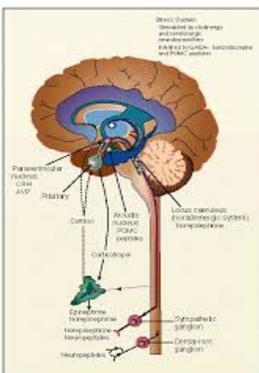


St. John's Wort (*Hypericum perforatum*) is known to contain **at least five different constituents which contribute to its activity** as an antidepressant. The first to be identified were hypericin and pseudohypericin. Subsequent research found that hyperforin worked synergistically with the hypericin. Later studies identified norathyriol and the flavonoid hyperin as important synergists. Small amounts of melatonin are also found in the plant. **Various combinations of these compounds, as well as broad-spectrum extracts of the herb, have been found to have greater activity than any individual constituent alone.** - Lisa Ganora

Endocrine System Herbs

23. _____ True or False: Humans require help from healthy gut flora (probiotics) in order to make use of some of phytoestrogens found in plants.
24. _____ What flavone phytoestrogen found in honey and Passion flower has been shown to enhance the formation of bone due to its impact on estrogen receptors?
- a. Apigenin
b. Chrysin
c. Luteolin
d. Anthocyanin
25. _____ What phytoestrogen constituent was the most prolific in our Western diet before our government started subsidizing soy?
- a. Stilbenoids
b. Isoestrogen
c. Coumestans
d. Lignans
26. _____ There are multiple reasons to avoid eating unfermented soy and soy products. One reason is that unfermented soy contains an enzyme inhibitor of trypsin. The enzyme trypsin is necessary for the digestion of...
- a. Protein
b. Carbohydrates
c. Fats
d. All of the above
27. _____ True or False: Research reveals females who consume high amounts of phytoestrogens have a decreased incidence of breast cancer.

28. _____ Fat-soluble phytosterols are very beneficial and can be used for:
- Binding cholesterol
 - Lowering blood sugar
 - Modulating the immune system
 - All of the above
29. _____ True or False: Wild Yam (*Dioscorea spp.*) contains the steroidal saponin, dioscin, which is metabolized into progesterone by the body. (See page 319)
30. _____ True or False: Phytoestrogens can be beneficial in female conditions stemming from estrogen excess as well as condition of estrogen deficiency.
31. _____ An amphoteric herb:
- Stimulates neurological function and can be useful in reducing brain fog
 - Has the ability to upregulate and downregulate body function
 - Is utilized across all herbal schools (TCM, Western, Ayurveda, etc.)
 - Has both fat-soluble and water-soluble properties
32. _____ For women looking to decrease the production of breast milk, which one of the following herbs would be the best choice?
- Sage
 - Fennel
 - Fenugreek
 - Milk Thistle
33. _____ The Islets of Langerhans are groups of endocrine cells found in the pancreas that work to control blood sugar. Within these groups the *alpha* cells produce which hormone?
- Insulin
 - Epinephrine
 - Glucagon
 - Pregnanolone
34. _____ True or False: Herbal adaptogens are valuable for stabilizing blood sugar.
35. _____ True or False: Utilizing hypoglycemic herbs and other supportive protocols for Type I diabetes does not mean you can safely (or legally!) recommend a Type I diabetic cease using insulin.



Both chronic emotional stress and chronic infection(s) result in the ongoing release of cortisol and other steroidal glucocorticoids. Prolonged exposure to glucocorticoids can disrupt the interactions between the hypothalamus, pituitary gland, and adrenal glands (HPA axis). The HPA axis is a neuroendocrine system that regulates digestion, the immune system, energy storage and expenditure, and influences our mood and emotions. HPA axis dysfunction increases the risk of depression, anxiety, digestive and sleep problems, headaches, weight gain or loss, type 2 diabetes, and heart disease. Fatigue, muscular weakness, excessive free radicals, mitochondrial dysfunction and increased levels of pro-inflammatory cytokines are also associated with HPA axis dysfunction.

36. _____ The primary job of the thyroid gland is to:
- Govern the secretion of gastric juices
 - Keep the neck warm
 - Regulate calcium blood levels
 - Regulate the body's metabolism
37. _____ Research has revealed certain nutrients necessary for proper thyroid conversion. Which of the following are particularly noteworthy?
- Iodine, Magnesium, Manganese
 - Selenium, Iron, Zinc, Copper
 - Niacin, Vitamin K, Vitamin C
 - Both A & B
38. _____ Two "antithyroid" herbs (decrease thyroid activity when in a hyperthyroid state). Bugleweed & Lemon Balm, are most effective when used as a:
- Fresh liquid extract
 - Dried herbal tincture
 - Poultice placed directly over the thyroid
 - Both B & C
39. _____ True or False: The predominate physiological manifestation of chronic stress is mitochondrial disfunction.



Ashwagandha (*Withania somnifera*) "In an 8-week, randomized, double-blind, placebo-controlled study ashwagandha was associated with greater reductions in anxiety, morning cortisol, c-reactive protein, pulse rate, and blood pressure in chronically stressed adults. Greater increases in serum dehydroepiandrosterone sulfate (DHEA-S) and hemoglobin were also noted. Further randomized, double-blind, placebo-controlled studies have confirmed ashwagandha's anti-stress and cortisol-lowering effects in adults with self-reported chronic stress and chronically stressed overweight and obese adults. In all these studies ashwagandha was well tolerated with minimal adverse effects reported." - www.ncbi.nlm.nih.gov/pmc/articles/PMC6750292/

Urinary Tract System

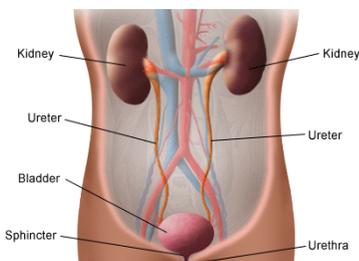
40. _____ True or False: Urea is carried from the bloodstream to the kidneys. The kidneys remove urea by filtering the blood through the nephrons.
41. _____ Diuretic herbs stimulate and increase the of urine produced by the the kidneys. They are also indicated for excess fluid from the following conditions:
- Cardiovascular disease
 - Lymphatic congestion
 - Liver disease
 - All of the above

The kidneys play many important roles in maintaining health, including the excretion of toxins. Most consider the kidneys second only to the liver in importance for toxin elimination. They rid the body of metabolism products such as ammonia, urea, uric acid, creatinine, and hormone metabolites; water-soluble toxins from phase 2 liver detoxification; they excrete industrial toxins and heavy metals as well as excess nutrients or food constituents when too much is consumed (salt, vitamin C, B vitamins, etc.).

Chronic kidney disease (also known as chronic renal failure) is the gradual and progressive loss of kidney function that often goes undetected until the disease is in advanced stages. Globally, chronic kidney disease is the 12th most common cause of death. Stanford Medical reported in 2014 that researchers at the Stanford Institute and the Sackler School of Medicine in Israel “have shown how the kidneys constantly grow and have surprising ability to regenerate themselves, **overturning decades of accepted wisdom** that such regeneration didn’t happen”. Prevention of course is always the best health strategy.

One of the big challenges for the kidneys is that although they are effective at removing many toxins from the blood, some are difficult to then excrete into the urine. This means some types of toxins accumulate in the kidneys and as their concentration increases, they damage the kidneys, especially the nephrons and glomeruli. Most damage takes years or even decades to become apparent.

Nephron damage results in the inability of the kidneys to either partially or completely filter waste products from the blood.



Both high blood pressure and diabetes over time can cause kidney disease. Diabetes changes the blood vessels in the body, including the blood vessels that deliver blood to the kidneys. When the nephrons don’t get enough blood, they are severely damaged. As a result, the blood can’t pass through the kidneys and the nephrons can’t filter wastes from the blood, or perform their other functions. Damage to the nephrons from unused glucose in the blood is called diabetic nephropathy.

Glomeruli are small structures in the kidneys that supply blood flow to the nephrons. The kidney disease known as glomerulonephritis is when the glomeruli become inflamed and impair the kidney’s ability to filter urine. Pyelonephritis is an infection most often caused by a microorganism that travels from the bladder to the kidneys. Severe or frequent infections of this type can cause damage to the kidneys leading to kidney failure. Renal failure can also occur from acute poisoning or trauma (forceful blow to the kidneys).

42. ____ True or False: Hibiscus is a diuretic herb with potassium sparing effects, reduces high blood pressure, and decreases edema.
43. ____ True or False: Nettles are not a diuretic herb but the herb does help remove stone forming elements.
44. ____ True or False: Antilithic herbs gently flush the kidneys and help prevent stones or gravel from accumulating in the kidneys.

From Harvard Health Publishing: A risk factor for all stones, regardless of type, is dehydration. All kidney stone sufferers should remember the phrase, "Dilution is the solution to the pollution." Good hydration is a safe and useful therapy for all stone formers.

- Calcium stones are the most common type of kidney stones, and can be either **calcium oxalate** or **calcium phosphate**. It may be surprising, but results of a randomized clinical trial show that people with calcium kidney stones should not cut back on dietary calcium. Why? Calcium binds to oxalate in the intestine and prevents its absorption through the gut, so there is less in the urine to form stones.
- Most patients with uric acid stones don't have too much uric acid. **Instead their urine is too acidic**. When that happens, normal levels of uric acid dissolve into the urine where it can crystallize into stones. Adjusting the pH of the urine, most commonly with the medication **potassium citrate**, reduces the risk of uric acid stone formation and can also help dissolve existing stones. **Sodium bicarbonate (baking soda)** can also be used to alkalize the urine. Some people with uric acid stones do produce high amounts of uric acid. For these patients, eating less animal protein can help.
- Struvite stones are composed of **magnesium ammonium phosphate**, and form in alkaline urine. The most common cause of struvite stones is a **bacterial infection** that raises the urine pH to neutral or alkaline.

At least 40% of Americans consume at least twice the recommended daily allowance of phosphorus. Excessive phosphorous consumption "significantly disrupts hormonal regulation of phosphorus, calcium, and vitamin D, causing disordered mineral metabolism; osteoporosis; cardiovascular disease; and impaired kidney function. Anything that decreases blood flow to the kidneys results in decreased excretion of toxins. Excessive phosphates damage the tubules, increase fibrosis blocking the blood vessels, and decrease glomerular filtration rate. **One of the early signs of kidney failure is increasing phosphate levels in the blood.** The primary sources of 'hidden' phosphates are food additives and carbonated beverages. -

www.ncbi.nlm.nih.gov/pmc/articles/PMC4718206/

45. _____ Which kidney tonic herb is used for the treatment of chronic glomerulonephritis and is useful at reducing all uremic indices when used in the early stages of kidney failure:
- a. Milk Thistle (*Silybum marianum*)
 - b. Turmeric (*Curcuma longa*)
 - c. Danshen (*Salvia miltiorrhiza*)
 - d. Ginseng (*Panax spp.*)
46. _____ Which herb is in the Polygonaceae/Buckwheat family, is bitter, sour, and astringent, increases glomerular filtrations, and is used for nephritis in conjunction with other treatments:
- a. *Astragalus membranaceus*
 - b. *Hibiscus sabdariffa*
 - c. Dandelion (*Taraxacum officinalis*)
 - d. Rhubarb (*Rheum officinalis*)

Kidneys, vitamin D and Bone Health:

Individuals with chronic kidney disease have an exceptionally high rate of severe vitamin D deficiency. The final activation stage of vitamin D into its most active 1,25(OH)2D3 form occurs in the kidneys. Vitamin D is required to balance/control calcium and phosphorus levels in the blood. In kidney failure, the parathyroid glands may incorrectly determine that there is not enough calcium in the blood and produce excess parathyroid hormone (PTH) which tells the body to pull calcium out of the bones and put it in the bloodstream.

Hyperparathyroidism often results in bone pain and weak bones that fracture easily. Excess calcium in the blood stream also leads to calcium “rock” deposits in soft tissues - calcifications. Calcification may occur in the lungs and cause difficult breathing, in the heart which can cause a heart attack, and in the joints which causes extreme pain.

Toxins that damage the kidneys

- Agricultural chemicals have been implicated in the pathogenesis of chronic kidney disease. One of the many studies researching the association between chronic kidney disease of unknown origin (CKDu) and blood level of organochlorine pesticides found that: “Increased level of OCPs, namely α -HCH, aldrin, and β -endosulfan, were observed in CKDu patients as compared to healthy control and CKD patients of known etiology. The levels of these pesticides significantly correlated negatively with the estimated glomerular filtration rate (eGFR) and positively with urinary albumin of CKD patients.” - link.springer.com/article/10.1186/s12199-017-0660-5
- Cadmium has a half-life of more than 10 years and it is very difficult to excrete - the kidneys hold 50% of the total body burden. “Once cadmium enters the body, much of it is bound to metallothioneins. These compounds are cleared through the glomeruli but are then reabsorbed by the tubules where they then become stuck. As the metallothioneins slowly degrade, highly toxic free cadmium is constantly released. Although it then passively migrates into the urine, it also causes oxidative stress to the tubules”. - www.ncbi.nlm.nih.gov/pmc/articles/PMC4718206/
- Soybeans are grown with high phosphate fertilizers that are contaminated with varying levels of cadmium (Cd). “Because fertilization increases the risk of Cd transfer to the food chain, some governments have imposed limits restricting the Cd content of P fertilizers. However, scientific risk assessments have shown that P fertilizer containing Cd is safe and does not pose risk to human health”. - www.sciencedirect.com/science/article/pii/S1877705814011059
- “Most nonsteroidal anti-inflammatory drugs (NSAIDs) were initially available only by prescription and then became available over the counter when their patents ran out. Many of these now readily available drugs have long-term side effects that are not adequately appreciated by most people. Virtually all safety studies are short term, so many toxic effects are not detected during the research and development stages and are now showing up in population studies. Acetaminophen, aspirin, ibuprofen, naproxen, indomethacin, and COX-2 inhibitors have now all been shown to cause kidney damage when used chronically.” www.ncbi.nlm.nih.gov/pmc/articles/PMC4718206
- The kidney is a target organ in heavy metal toxicity for its capability to reabsorb and concentrate divalent ions and metals. Kidney damage has been strongly linked to cadmium, mercury, arsenic, lead, and lithium. Aluminum toxicity occurs in individuals with kidney dysfunction and disease (unable to excrete aluminum) but it is not widely accepted that aluminum causes the kidney dysfunction.
- The most toxic forms of arsenic are the trivalent arsenic/arsenite compounds. Not all forms of arsenic are “toxic” and the body is able to clear them if the kidneys and liver are functioning optimally. In addition to cancers, long-term exposure to arsenic is also associated with skin lesions, cardiovascular diseases, diabetes, birth defects, abortion and cognitive impairment. “Arsenic-based pesticides are the best examples of agricultural applications of arsenic. During the beginning and middle of the 20th century, inorganic arsenic-based pesticides, including lead arsenate, copper arsenate and calcium arsenate, were extensively used to control insects. It has been reported that approximately 15 million pounds of arsenic-based pesticides, which is equivalent to 6.8 million kilograms of arsenic, were applied to New Jersey (USA) soils between 1980 and 1990”. - www.ncbi.nlm.nih.gov/pmc/articles/PMC4730524/

- Mercury exists in three forms: elemental, inorganic and organic. Individuals are primarily exposed to the organic forms by consuming fish (tuna, swordfish) and inorganic forms with the use of amalgam fillings. Occupational exposure occurs in alloys and thermometer factories, chloralkali industries, and in dentistry. After acute exposure to mercury, acute tubular necrosis appears, usually accompanied by oligo-anuria. In chronic exposure mercury is stored in the kidney where it can induce necrosis in the tubules.
- Lead (Pb) is the most pervasive of the nephrotoxic metals. Lead exists in three different forms: organic form, such as tetramethyl lead (most toxic form), metallic lead, and inorganic lead (water-soluble lead salts). Workers in manufacture of ammunition, batteries, sheet lead, bronze plumbing, radiation shields, and intravenous pumps have a high exposure.” Congress banned the use of lead pipes in 1986 but allowed those already in the ground to remain. Three decades later, an estimated 15 to 22 million Americans still cook with and drink tap water entering their homes through lead pipes, known as "service lines.” - Amp Reports May 4, 2020

Heavy metal clearance: Do not start a heavy metal elimination/reduction program before addressing all possible nutrient deficiencies, constipation, diarrhea, or digestion issues (bowels) and liver/gallbladder issues/needs. There are many herbs and considerations depending on the individual, however, there are basics that need to be included:

- Water Water Water!
- Herbal Kidney Teas: Nettles, Hibiscus, Dandelion, etc.
- Herbal Liver Support: Milk thistle, Yellow dock, fat-soluble vitamins, etc.
- Dietary fiber & pectins
- Daily sulfur containing foods including garlic, onions, cabbage, broccoli, and other Brassica foods. Taurine and methionine are sulfur-containing amino acids that decrease oxidative stress markers resulting from heavy metal exposure.
- Sulfur and vitamin C raise glutathione levels. Glutathione is an important chelator and the reduced form of glutathione protects cells from reactive oxygen species associated with heavy metals.
- N-acetyl-cysteine (NAC) is a precursor of cysteine and a chelator of toxic elements. NAC also stimulates glutathione synthesis in the presence of vitamins C and E.
- Alpha lipoic acid is a powerful antioxidant that regenerates other antioxidants (e.g., vitamins E and C, and reduced glutathione) and has metal-chelating activity. Both fat and water soluble, it is readily absorbed from the gut and crosses cellular and blood-brain membrane barriers. Clinical experience is that it must be used carefully as it poses particular risks of redistribution of metals - use with other supportive herbs and foods and **remember that more is not better.**
- Selenium: “The selenide ion forms an extremely stable, insoluble compound with mercury, and provides relief of mercurialism symptoms...Selenium depletion in the face of mercury exposures also depletes seleno-enzymes. In humans, organic selenium supplementation was beneficial in a controlled trial among 103 mercury-exposed villagers. A selenium yeast product increased mercury excretion and decreased oxidative stress-related biomarkers urinary malondialdehyde and 8-hydroxy-2-deoxyguanosine”. - www.ncbi.nlm.nih.gov/pmc/articles/PMC3654245/

~ End of Test ~