

*Extracts from*

**Nutritional Physiology :  
Clinical Applications  
and Scientific Research**

Lynn Toohey, MS, PhD  
Sylvia Kreutle, MS

Copyright © 1995-1999 HealthQuest Publishing. All rights reserved.

This document contains example text taken from the book with the intention of giving an indication of the level of detail and the style used.

If you like what you see, you can purchase the Nutritional Physiology book in its entirety. This is available online for purchase and download from the World Wide Web. Note that the book files are encrypted and you must enter a password in order to access them. You will be provided with a password when your order is accepted.

**Important  
Copyright  
Notice:**

The Nutritional Physiology book and extracts thereof (Copyright © 1995-1999 HealthQuest Publishing) must not be copied or redistributed without written permission. Licensed users may view the book online on a single computer system only and they may take copies only for their normal backup procedures. Licensed users may also print a single copy of the book for their own use. Accessing the sample text or downloading the book indicates your acceptance of these terms.

**COMPUTERS SUPPORTED:** Please note that the online book is only compatible with IBM-compatible PCs running Windows 3.1, Windows for Workgroups, Windows 95/98, or Windows NT. Please contact us if you wish to use these documents on a Macintosh or any other non-Windows system.

**CLICKABLE LINKS AND THE CONTENTS SECTION:** The full book contains more than 250 pages and it has a comprehensive Contents and Index section. The page numbers in the Contents section of the full online book can be clicked to go straight to the appropriate section. This extract contains the full Contents section but the links are not clickable. Please ignore this as it only affects this extract.

**PURCHASING THE BOOK:** You can purchase a license for the Nutritional Physiology book online from the World Wide Web.

**EXTRACTS:** The text which follows presents some random extracts from the book and ends with the full Contents listing.

First printing 1995. Revised 1998, 1999.

Copyright © 1995-1999  
HealthQuest Publishing  
A division of HealthQuest, Inc.  
All rights reserved.

#### **GENERAL DISCLAIMER**

The nutritional suggestions and research reported in this book are not offered to treat, mitigate or cure disease, and should not be used as a substitute for sound medical advice. This book is designed to be used in conjunction with the services provided by a trained, licensed healthcare practitioner.

#### **CAUTION**

Caution should be used in all conditions, especially concerning pregnancy and children, when taking herbal supplements or high potency nutrients. A physician knowledgeable in natural and preventative medicine should be consulted.

#### **NUTRITION ON THE INTERNET**

For more information, please refer to the following World Wide Web addresses:

<http://www.nutri-notes.com>

<http://www.hquest.com>

# SUBCLINICAL AND PATHOLOGICAL CONDITIONS OF THE GASTRO-INTESTINAL SYSTEM

## GASTRO-INTESTINAL DISTRESS

### **CONSTIPATION**

Change in bowel movements, mainly in the number of bowel movements or a change in the consistency of bowel movements.

#### ***Signs and Symptoms of Constipation:***

- unable to have regular bowel movements (1-3 bowel movements per day is typical in healthy people eating diets high in fiber)
- pain during bowel movements

#### ***Possible Causes:***

- 1) Insufficient fluids in the diet
- 2) Too little fiber in the diet
- 3) Emotional stress
- 4) Excess fat and refined foods
- 5) Lack of exercise
- 6) Side effects of drugs including pain killers, anti-depressants, hypertensive medication, and drugs used to treat Parkinson's disease
- 7) Pregnancy
- 8) Iron supplements
- 9) Laxative or enema abuse
- 10) Elderly
- 11) Hypothyroidism
- 12) Bowel diseases including IBD (Inflammatory Bowel Disease), diverticulosis and IBS (Irritable Bowel Syndrome)
- 13) Insecticide exposure
- 14) Food allergies

#### ***Nutrient Applications:***

- 1) Lactobacillus acidophilus and bifidus
- 2) Fiber
- 3) Chlorophyll
- 4) Magnesium

#### ***Dietary and Lifestyle Applications:***

- 1) Drink 6-8 glasses of water per day.
- 2) Increase the amount of fiber in your diet. Bran, a hydrophilic fiber is specifically helpful. Corn bran is better than wheat bran and oat bran is not as irritating as both and absorbs fat better. Make sure food allergies are not present.
- 3) Incorporate exercise into daily routine.
- 4) Increase magnesium-rich foods including dark, leafy green vegetables.
- 5) Incorporate bananas, apples, prunes, oranges, oatmeal and flaxseeds into your diet.
- 6) Licorice tea is helpful in chronic constipation. **CAUTION:** Do not give to people with high blood pressure.

- 7) Aloe vera juice is helpful.
- 8) Flaxseed oil or flaxseed tea may be beneficial.
- 9) Epsom salt baths will increase circulation and relax a person, which may stimulate bowel movements.
- 10) Stomach massages may be helpful.

***Considerations:***

- 1) Breast-fed babies will have fewer bowel movements than bottle-fed babies because the breast milk is used very efficiently.
- 2) Functions and problems with some laxatives include:
  - Castor Oil:** it works by irritating the intestinal wall, thus stimulating peristalsis. It undergoes a chemical change in the colon and becomes an acid. This acid prevents the intestines from absorbing water. Prolonged use can damage the cells that line the intestines.
  - Psyllium Seed:** increases bulk in the intestines, initiates peristalsis and softens the stools; can cause allergies in some people.
  - Milk of Magnesia:** a magnesium hydroxide that draws fluid from the body into the intestines.
  - Mineral Oil:** coats the stool to make it easier to evacuate. Prolonged use can cause inflammation of the spleen and liver and create problems with fat-soluble vitamin absorption. It also clogs the lymph system.
  - Any excessive laxative abuse** will flush out necessary vitamins and minerals, decrease intestinal function and cause an excessive excretion of water, sodium, potassium and electrolytes.

- 
- 
- 

***COLIC***

Abdominal pain caused by spasms of the intestines. It is most commonly found in infants when the infant continually cries no matter what efforts are used to console the child.

***Signs and Symptoms of Colic:***

- continuous crying, despite any efforts to console the child
- in infants, the abdomen may be distended and the legs are pulled into the chest
- pain in the abdomen

***Possible Causes:***

- 1) Swallowing air which can cause gas pain
- 2) Food allergies to formula or something the mother is eating
- 3) Spastic colon (hyperactive GI tract)
- 4) Stress in the home (anxiety or tension)
- 5) Overfeeding

***Nutrient Applications:***

- 1) Acidophilus and bifidus - for mother and child
- 2) Chamomile, fennel, licorice, ginger and peppermint

- 
- 
-

# THE PHYSIOLOGY OF THE MUSCULOSKELETAL SYSTEM

The musculoskeletal system of the body is composed of the skeletal system (bones, cartilage and joints), muscles, ligaments, tendons, and connective tissue, which act in concert together to supply humans with a wide range of movement.

## BONES

The 206 bones of the body make up a framework, or skeleton, that give it its structure and shape. They serve to:

- 1) protect the soft tissues and organs.
  - 2) act as a reservoir of minerals.
  - 3) generate the cells of the blood (including some of the infection-fighting white blood cells).
- 
- 1) **Protection** - the bony structure of the skeletal system encases vulnerable organs, such as the skull around the brain, and the ribcage around the heart and lungs.
  - 2) **Mineral Reservoir** - Bones are composed of inorganic salts, including calcium and phosphate, which are embedded into collagen. The homeostasis of the blood calcium concentration, necessary for maintaining health, depends on the changes of calcium movement between the blood and the bones. When blood calcium is low, parathyroid hormone works to take calcium out of the “storagehouse” and put it into the blood. If blood calcium is high, the direction of movement would be higher in the other direction, (i.e. into the bone).
  - 3) **Cell Formation** - Red bone marrow is the site for blood cell formation. This includes red blood cells, which perform their function in the blood vessels (their main function is to control hemostasis and blood clotting after injury), and also white blood cells, which perform their function in the tissues (their main function is to phagocytize bacteria and infectious organisms). White blood cells formed from bone marrow include neutrophils, eosinophils, basophils, and some lymphocytes and monocytes.

The intercellular substance of bone makes up the matrix, and contains many fibers of collagen. In the developing fetus, the complex process of ossification changes cartilage and fibrous membranes to bone. Bone-forming cells (osteoblasts) secrete carbohydrate and collagen. The collagen gets embedded in the carbohydrate, or cementing substance, and constitutes the matrix.

Bones grow by the combined action of osteoblasts and osteoclasts. **Osteoclasts** enlarge the area of the bone cavity by eating away at the bone of the cavity walls, and **osteoblasts** build new bone around the perimeter. In childhood and adolescent years, this ossification (bone-building) process exceeds bone destruction; the process evens out in later years, however, and after the age of 35-40, bone loss exceeds bone gain. As thickness of bone decreases, and the size of the cavity increases, bones are less apt to resist compression and bending. Vertebrae collapse, to some extent, causing the decreased height seen in old age. Regular exercise, which subjects bone to a form of stress, forces the bone to lay down more mineral salts and collagen fibers, thereby strengthening the bone.

The difference between the collagen fibers of bone, and that of other connective tissue, is that they are tough and rigid - mainly due to deposits of calcium salts. Bones are living structures, and so must receive food and oxygen, and eliminate metabolic wastes. For this reason, bone is well-perfused with blood vessels.

## BONE DISORDERS

**Osteoporosis:** Osteoporosis involves a loss of calcium and phosphate salts, resulting in bone that is weak, porous, brittle, and very susceptible to breakage. It is characterized by low bone mass, however, the composition of the remaining bone is chemically normal. In other words, there is normal mineralization, but abnormal remodeling, hence lower bone mass. When it occurs in the spine, the vertebrae may get compressed and cause deformities of the spine. Risk factors include a low calcium intake, hormonal changes associated with aging/menopause, amenorrhea, alcoholism, smoking, lactose intolerance, overactive thyroid, and impaired calcium absorption.

**Osteomalacia,** on the other hand, is characterized by bone that is abnormal, due to impaired mineralization. While it also results in lower bone mass, the remaining bone is not chemically normal. For instance, the mineralization of bone requires phosphorous as well as calcium, and in one type of osteomalacia (Oncogenic osteomalacia), phosphorus and vitamin D are both inhibited. Chronic consumption of phosphate-binding antacids can cause hypophosphatemic osteomalacia (Shils and Young, pp. 864, 878). **Rickets** is a form of osteomalacia defined as defective mineralization, which happens at the epiphyseal plate (of growing bones).

## CARTILAGE

Cartilage is very similar to bone, in that it is made up of many collagenous fibers. However, in cartilage, the fibers are embedded in a firm gel, instead of the hard, cement-like substance of bone. This is why cartilage is firm but flexible, while bone is tough and rigid. Oxygen and nutrients have to diffuse into cartilage, because it is not perfused with blood vessels like bone. There are three types of cartilage:

- 1) **Hyaline** - Hyaline cartilage is the most abundant cartilage, covering the articular surfaces of bones and helping to cushion them from injury.
- 2) **Fibrous** - Fibrocartilage has the most collagenous fibers in its matrix, and is therefore the strongest. Fibrocartilage is between the disks of the vertebrae, and helps to cushion the spine against jolts.
- 3) **Elastic** - Elastic cartilage has elastic as well as collagenous fibers, so it is flexible as well as being firm. The external ear and Eustachian tube are composed of elastic connective tissue.

## JOINTS

Joints occur between the bones, and hold the bones together, while allowing movement between them. For the most part, people are generally unaware of their joints, unless a tissue dysfunction causes painful awareness. On the basis of structure, there are three main types of joints:

- 1) **Fibrous** - Fibrous joints are between the articulating surfaces of bones, binding extremely close together and preventing movement, such as skull bones.
- 2) **Cartilagenous Joints** - Cartilagenous joints are connected by cartilage that allows a minimum amount of movement, such as the vertebrae.
- 3) **Synovial Joints** - Synovial Joints are freely movable, abundant, and complex joints. They can be characterized by: a joint capsule, a synovial membrane (secretes lubricating synovial fluid), articular cartilage (to cushion the surface of the bones), a joint cavity, menisci (pads of fibrocartilage; the knee has several menisci), and/or ligaments (fibrous connective tissue which holds bone to bone).

## JOINT DISORDERS

In a normal joint, the bones are lubricated at their junction by synovial fluid secreted by the synovium, which is a thin membrane on the inside of the ligaments that covers the joint. The ligaments, along with the synovial lining, encapsulate the joint and protect it. In addition, a layer of cartilage also cushions the ends of both bones. In **rheumatoid arthritis**, the synovium becomes inflamed and swollen. This damages the...

- 
- 
-

# NUTRIENT APPLICATIONS

## ALOE VERA

“All is well, aloe is on board” - Christopher Columbus.

The pulp of the aloe vera leaf contains mostly **water**, in a **mucilaginous gel** that can provide water to injured tissue without sealing off the air needed for tissue repair (Heinerman, J. Heinerman's Encyclopedia of Fruits, Vegetables and Herbs. 1988; Parker Publishing, West Nyack, NY. p. 5). In addition to water, the gel is packed with **complex carbohydrates, enzymes, amino acids, vitamins and minerals** (Heinerman, J. Heinerman's Encyclopedia of Fruits, Vegetables and Herbs. 1988; Parker Publishing, West Nyack, NY. p. 5). Known for its healing properties, it is used for many conditions, including topically for **cuts and burns**. Aloe is known as an **intestinal purgative** that **stimulates colon activity** and is **helpful in constipation**. Aloe vera contains **acemannan**, which is the polysaccharide component of aloe thought to have **antiviral and immune-enhancing activity**. Among aloe's other virtues, it is known to help in **insect bites and stings, edema (swelling), periodontal surgery, cold sores and candidal dermatitis** (caused by infection of *Candida Albicans*) (Heinerman, J. Heinerman's Encyclopedia of Fruits, Vegetables and Herbs. 1988; Parker Publishing, West Nyack, NY. p. 4).

Aloe vera aids in the **healing of stomach disorders and ulcers**, by providing tissue protection to the gastro-intestinal mucosa. (Balch JF Presc for Nutr Healing 1990, Garden City Park, NY). “Aloe vera **improves wound healing and inhibits inflammation**” (Davis RH. J Am Podiatr Med Assoc 1994;84(2)77-81). Aloe vera extracts have been shown to **decrease wound diameters** by almost 50% (J Am Podiatr Med Assoc 1991;81(9):473-8). A research study showed that aloe vera **reduced inflammation, regenerated epithelial cells, and increased overall wound healing** by 72 hours - “This acceleration in wound healing is important to reduce bacterial contamination” (J Dermatol Surg Oncol 1990;16(5):460-7). Aloe vera is also **helpful in food allergies**, which is suspected in association with ulcers. In fact, Delazzari et al propose that their data on IgE levels and gastric bacteria, “lend support to the hypothesis of an underlying immuno-allergic reaction in some forms of gastric or duodenal ulcer” (Scand J Gastroenterol 1994 (Suppl) 201:11). And so, in addition to the soothing effect of aloe vera on the mucosa, it may be helpful also by way of influencing food allergies.

- 
- 
- 

## COENZYME Q10

This **vitamin-like nutrient** is one of the **electron carriers in the electron transport system** (ATP generation), and may **help cells utilize oxygen** (Mayell, M. The Natural Health First Aid Guide; p. 298). Oxygen supply is necessary for **tissue repair and immune function**; this could be why coenzyme Q purportedly **increases antibody count** and is helpful in **treating candidiasis**. In a test for oxidative performance in patients with myopathies, **treated patients experienced higher oxygen consumption and threshold to higher workload**, indicating, “**improvement of mitochondrial function**” (Neurology 1992;42(6):1203-8).

Coenzyme Q concentration in the mitochondrial membrane is not believed to be saturated for NADH (another important energy enzyme) oxidation, and, “This provides a rationale for the **reported therapeutic effects of coenzyme Q** under conditions when its concentration is decreased” (Clin Investig 1993;71(8 Suppl):S66-70). Perfusion of Coenzyme Q into rat livers **prevented oxidative stress and mitochondrial damage** (Clin Investig 1993;71(8 Suppl):S66-70).

Lieberman notes that coenzyme Q10, “has demonstrated excellent results in clinical trials on periodontal disease” (Mayell p. 298). “The studies have been positive in showing a speedup of healing time, reduced pockets, and improvements in other factors associated with gum disease” (ibid, p. 298). The therapeutic potential of this antioxidant is discussed in, “Antioxidant systems - physiology and pharmacotherapy trends” by P. Grieb (Mater Med Pol 1992 24(4):217-222).

Two patients with mitochondrial encephalomyopathy received 150 mg/d of coenzyme Q10 during ten months of treatment. After treatment, the bicycle ergometer exercise test indicated a **significant improvement with a decrease in resting blood lactate level, an increase in oxygen consumption during exercise, and an increase in the kinetics of lactate disappearance during the recovery period.** A shift of the ventilatory threshold to **higher workload** was present...These observations indicate an **improvement of mitochondrial function** and a shift from **high to low glycolytic activity** in both patients consequent to Coenzyme Q treatment” (Neurology 1992;42(6):1203). This is because the mitochondria make energy (ATP) during aerobic, or oxygen-dependent activity, while glycolytic activity is anaerobic, or not dependent on oxygen.

- 
- 
- 

## **ELUTHERO (Siberian Ginseng)**

Siberian ginseng is widely used by Russians to **improve stamina and resist stress** (Wild, R., ed. The Complete Book of Natural and Medicinal Cures. 1994. Rodale Press, Emmaus, Pa. p. 303). It is utilized to combat fatigue, and normalize blood sugar levels, whether high or low (Mowry, D Scientific Validation, p. 27). “Ginseng species **stimulate the central nervous system in small amounts and depress the central nervous system in large doses; they protect the body and nervous system from stress; they stimulate and increase metabolic function; increase physical and mental efficiency; lower blood pressure and glucose levels when high, and raise them when low; increase gastrointestinal movement and tone; increase iron metabolism; and cause changes in nucleic acid (RNA) biosynthesis**” (ibid, p. 288).

Most of the activity of Siberian ginseng is attributed to the eleutheroside content, which has demonstrated adaptogenic abilities, defined by Brekhman as having normalizing action, irrespective of the direction of the pathological state (Farnsworth NR et al., Econ Med Plant Res 1985;1:156-215). It is believed that this adaptogenic capability may act through the pituitary-adrenocortical system (Filaretov AA et al. Effect of adaptogens on the activity of the Pituitary-Adrenocortical System in Rats. (Russian). Bull Eksper Bio Med 1986;101:573). One of the components in Siberian ginseng has demonstrated antiplatelet activity, which means it may help prevent blood clotting (J Nat Prod 1987;50:1059). Recommended dosage can be up to 600 mg/day of the solid extract.

Even though Siberian ginseng is not considered a “true” ginseng by some (it is in the same family, but not the same genus), all the ginsengs should be used with caution in combination with drugs associated with the treatment of conditions related to symptoms of excess ginseng supplementation, i.e. blood pressure drugs, heart medication, and particularly digitalis-like drugs. A physician should be consulted about combinations. Possible antiplatelet activity means that Coumadin and other blood-thinning drugs should be used with caution when combined with herbs possessing this activity.

- 
- 
-

# BASIC NUTRITIONAL INFORMATION: VITAMINS

A vitamin is a substance that is needed by the body to sustain life; it cannot be synthesized by the body and must be ingested. For instance, the substance ascorbic acid is not needed by animals who synthesize it, so it is not a vitamin to them. Humans, however, do not possess the enzyme to change glucose into ascorbic acid, so to humans, ascorbic acid is known as, "vitamin C". Vitamins are divided into two groups: fat-soluble and water soluble. The water soluble vitamins are readily excreted, whereas the fat-soluble vitamins are stored in the liver and fatty tissues.

## VITAMIN B-6 (Pyridoxine)

**Sources:** wheat germ, whole grains, organ meats (liver), fish, poultry, egg yolk, beans, bananas, prunes, potatoes, cabbage, avocados, cauliflower.

**Functions:** Although vitamin B-6 has three natural forms (pyridoxine, pyridoxamine, and pyridoxal), the phosphorylated form of pyridoxal, pyridoxal-5-phosphate (P-5-P), functions as the active coenzyme in a wide variety of functions. For instance, it is essential in amino acid metabolism; supports production of gamma-aminobutyric acid (GABA), which is important in central nervous system function; aids in antibody and red blood cell production, and also DNA and RNA synthesis; is important in fluid balance regulation (sodium/potassium balance); and helps maintain normal intracellular levels of magnesium. There is a high requirement during pregnancy for hormonal and fluid balance maintenance. B-6 is beneficial in fatigue, PMS, edema, carpal tunnel syndrome and amino acid metabolism.

**Possible Effects of Deficiency:** wide variety of symptoms including muscle weakness, nervousness, depression, irritability, dermatitis, cracks at the corner of mouth, glossitis (smoothness of tongue), visual disturbances, morning sickness, amino acid/protein abnormalities.

**Research:** Since it is necessary for nitrogen group transfer, B-6 is essential in protein synthesis and breakdown. The requirement for B-6 increases as dietary protein increases. This reflects the increased utilization of pyridoxal-5-phosphate, the active form, which is necessary for the breakdown of the protein to amino acids. Additionally, it is involved in glycogen breakdown, and the conversion of tryptophan to nicotinamide, a form of vitamin B-3. Since tryptophan can be converted to niacin, and vitamin B-6 is a necessary cofactor, the same pellagra-like symptoms can appear as in niacin deficiency when vitamin B-6 is marginal (Gastroenterology Clinics of North America 1990;19(2):p.482).

In diabetes, the glucose level is elevated. It then becomes "glycosolated" (forms an adduct with a protein). Often the protein it joins with is hemoglobin (Hg), and glycosolated Hg is used as an indicator of glucose control (H<sub>g</sub>A 1c) in diabetics. Glycosolated proteins then undergo free radical attack, causing vascular damage, retinopathy and cataracts. **B-6**, by forming a Schiff's base to generate **P-5-P** (a form of B6), interrupts the cycle at glycosolation, and prevents the formation of glycosolated proteins which are susceptible to free radical attack. "Solomon and coworkers have found that administration of high-dose B-6 for six weeks resulted in decreased levels of hemoglobin A 1c... these observations suggest **B-6 supplementation has a beneficial role** for persons with diabetes" (Annals NY Acad Sci., Beyond Deficiency, 1992, 669:39).

In, "A deficiency of vitamin B-6 is a plausible molecular basis of the retinopathy of patients with diabetes mellitus", the authors reported that in 18 patients, some of whom were followed up to 28 years, they, "established an association of a deficiency of vitamin B-6 with diabetes...", by monitoring enzyme activity and occurrence of carpal tunnel syndrome (they claim it has been known for a decade that carpal tunnel syndrome is caused by a B-6 deficiency). Their observation of the absence of retinopathy in the treated diabetic patients, "appears monumental" (Ellis JN et al. Biochem Biophys Res Commun 1991;179(1):615-19). Pain scores were improved in those patients following B-6 treatment, and, "vitamin B-6 has been shown to change pain thresholds in clinical and laboratory studies" (Bernstein AL. J of the Am Coll Nutr 1993; 12(1):73-6).

The researchers believe that carpal tunnel, whether or not it is caused by a deficiency of B-6, responds to B-6 therapy, with some responding better than others.

Sahakian et al. report in, "Vitamin B-6 is effective **therapy for nausea** and vomiting of pregnancy: a randomized, double-blind placebo-controlled study", that there was a significant difference in mean nausea scores (severity was graded on a scale of 1-10) (Sahakian V. et al. *Obstet Gynecol.* 1991; 78(1):33-36). The effectiveness against nausea makes it useful for morning sickness (Wright, Jonathan V. M.D. *Healing with Nutrition.* 1990. Keats Publishing, Inc. New Canaan, Conn. p. 519).

In the last decade, research has shown that elevated levels of **homocysteine** (indicating faulty methionine metabolism) may be a major risk factor in the development of vascular diseases, including coronary artery disease. Although genetic factors seem to play a role, "Mild hyperhomocysteinemia can be reduced to normal in virtually all cases by simple and safe treatment with **vitamin B-6, folic acid, and betaine**, each of which is involved in methionine metabolism. A clinically beneficial effect of such an intervention, which is currently under investigation, could make large-scale screening mandatory for this risk factor" (Boers GH. *Neth J Med.* 1994; 45(1):34-41). Increased **B-12** levels are also related to lower homocysteine values (Rosenberg IH. *Colloquium on Homocysteine, Vitamins, and Arterial Occlusive Diseases.* Experimental Biology Conference, Atlanta, Ga. 1995).

"The prognosis for patients with primary **hyperoxaluria** has been ominous, with the expectation of renal failure, poor results with transplantation, and early death.... Treatment of patients with primary hyperoxaluria with orthophosphate and pyridoxine decreases urinary calcium oxalate crystallization and appears to preserve renal function" (Milliner DS et al. *New England J Med.* 1994; 331(23):1553-58). Other patients, exhibiting hyperoxalemia in association with Crohn's disease- related renal failure experienced successful management with pyridoxine (Marangell M. *Nephrol Dial Transplant.* 1992; 7(9):960-4).

B-6 is associated with preventing hormonal water-weight gain during PMS, and the pill seems to increase the need for B-6 (Wright, Jonathan V. M.D. *Healing with Nutrition.* 1990. Keats Publishing, Inc. New Canaan, Conn. p. 519). B-6 also seems to help with some of the other symptoms of PMS. For instance, one of the symptoms of PMS can be a low level of brain neurotransmitters, specifically dopamine. Dopamine suppresses fluid retention hormone production, and stimulates elimination of salt and water (Murray M. *Enc Nat Med* p. 474). The enzyme that makes dopamine is dependent on B-6, "and high supplemental doses of vitamin B-6 result in increased hypothalamic dopaminergic activity ... in addition, pyridoxine normalizes low intracellular magnesium, lowers premenstrual oestradiol levels, and increases progesterone" (Murray M. *Enc Nat Med* p. 476). **B-6 should never be taken in amounts greater than 250 mg, because neurological problems have been known to result** (Murray M. *Enc Nat Med* p. 475).

- 
- 
- 

## B VITAMIN - BIOTIN

**Sources:** found in small amounts in egg yolks, liver, unpolished rice, brewer's yeast, milk, fish and nuts; also produced by the intestinal microflora.

**Functions:** essential for fat metabolism and aids in the production of DNA and RNA.

**Possible Effects of Deficiency:** Biotin is widely distributed in food, and a deficiency is not usually seen unless a person has consumed large amounts of raw egg white, which contains avidin (binds biotin). This is why dermatitis and depression can show up as a result of ingestion (*Gastroenterology Clinics of North America* 1990; 19(2):482). Deficiency symptoms include fatigue, anorexia, nausea, depression, dry, flaky skin and muscle weakness.

- 
- 
-

# HERBAL NUTRIENTS/VITAMINS/MINERALS AND DRUG/NUTRIENT INTERACTIONS

The recommendations of a trained licensed health professional are always advised when drug-nutrient combinations are considered. The information in this area is limited and several sources have been pooled to create this table. It is possible that interactions or depletions exist that have not been recorded. Special caution is always advised for children, pregnant or lactating women, elderly, and patients with liver/kidney disease (affects drug metabolism and clearance).

Many drug-nutrient interactions are actually potentiations, in other words, an herb or vitamin might potentiate the action of a drug, in which case the two may not be prescribed together. For instance, vitamin E is able to reduce blood clotting by reducing thromboxane A<sub>2</sub>, a potent blood clotter. Warfarin (eg. trade name Coumadin) is a drug which reduces clotting by interfering with vitamin K (an integral clotting factor). The potentiated action may thin the blood too much. There are case reports where increased bleeding resulted from combining the drug and the vitamin. Note, however, that less than 400 IU of vitamin E does not seem to cause a problem. It is when the vitamin E is taken in EXCESS that this potentiation has occurred (the current RDA is 10 IU for men and 8 IU for women).

Several herbs have anti-coagulant therapy, and should be recognized for this pharmacological actions. Herbs such as ginkgo biloba and fish oil have anticoagulant effects, and although it is possible to safely combine recommended amounts of these nutrients together, or in combination with vitamin E, these nutrients should be used with extreme caution in combination with anticoagulant drugs such as warfarin.

Several other herbs (listed below in the table) have exhibited mild anti-platelet action, and they are contraindicated (in large doses) with the anticoagulant drugs not because of reported side effects, but to err on the side of caution. Likewise, the German monograph warns against consuming St. John's wort and tyramine-containing foods at the same time (all MAO inhibitors carry this warning), even though the mechanisms by which St. John's wort works are not clearly defined, and no single case of an interaction with tyramine-containing foods has ever been reported, despite the fact that over 2.7 million prescriptions for St. John's wort have been filled in Germany.

Some drugs interact with nutrients and interfere with their metabolism or deplete their concentrations in the body. Some nutrients can interfere with drug metabolism or potentiate their action. Some examples are listed in the following table. When brand names are listed (Capitalized) it is suggested to cross-check generic drug names (lower case) to include other brands.

Many drugs deplete more than the major nutrients listed, so repletion with a multi-vitamin and mineral supplement may be in order when taking the drugs that are suspected of depleting nutrients. Minerals can contribute to our well-being, and can remove toxins and metals from our body, however they can also reduce the effectiveness of some drugs and should not be taken at the same time as certain drugs. Drug-Drug interactions are not listed here and can be found in other sources.

## ALL DRUGS

(esp. Hismanal, Sular, Procardia XL, Calan SR, Coumadin, Rythmol, Propulsid, Mevacor, Zocor, and Pravachol)

## Nutrient Interactions

GRAPEFRUIT JUICE; DETOX NUTRIENTS CHAMOMILE

### *Interactions*

Grapefruit juice has an interaction with several drugs, especially ones that employ the enzyme CYP 3A4 to metabolize the drugs. Grapefruit juice slows the enzyme responsible for this process, and the drugs are not metabolized as readily, hence the juice can potentiate the action of the drug. This interaction has not been seen with other juices such as orange juice. Circulating oral estrogens can be increased by a third when

taken with grapefruit juice. At least one case has proved fatal (Hismanal) with one hospitalization (Procardia XL combined with Calan SR). It is possible that there may be a cumulative effect.

An intense detoxification program may decrease the effectiveness of some drugs, because some of the nutrients, such as glutathione, are effective in removing toxins (and drug metabolites) by conjugating them and preparing them for elimination.

An ingredient in chamomile, bisabolol, may delay absorption of medications taken at the same time.

- 
- 
- 

## **BLOOD THINNERS**

warfarin, i.e. Coumadin, Panwarfin, Warfilone etc.

## **Nutrient Interactions**

VITAMIN E, VITAMIN C, FISH OIL, GARLIC, GINKGO BILOBA, DONG QUAI, BILBERRY, ASTRAGALUS, CAPSAICIN, FENUGREEK, VITAMIN K, COENZYME Q 10, FEVERFEW, PAU D'ARCO, GINGER, BROMELAIN

### ***Interactions***

**Interactions which potentiate the drugs:** Vitamin E thins the blood and should not be given (in amounts > 400 IU) at the same time as blood thinning drugs, or it could increase bleeding time. Amounts of 400 IU or less have not been reported to cause a problem. One of the reasons the eskimos have lower risk for heart disease is thought to be the blood thinning action of fish oil (the thinning may increase risk for stroke, however). Large amounts of fish oil should not be combined with anticoagulant drugs. Although the interaction is uncertain and not proven, vitamin C in large amounts (over 5 grams/day) could possibly interfere with the action of blood thinning medications. Vitamin C, like vitamin E, exhibits some effect on lowering levels of thromboxane A<sub>2</sub>, (thromboxane increases clotting).

**Interaction with herbs:** Several herbs also possess anticoagulant properties. It is a good idea to avoid potentiations by not combining significant amounts of these herbs with blood thinning medications. For instance, a few milligrams of garlic in a synergistic formula should not interact with blood thinning drugs. However, a standard dose of 500 mg of garlic as a single herb would definitely be contraindicated with the drugs. An interaction with the herb feverfew is suspected but has not been studied.

Some herbs possess anticoagulant properties to a lesser extent, and even though case reports have not been documented about specific interactions, it would be wise to exhibit caution with these nutrients in relation to these drugs. These include dong quai, pau d'arco, ginger, bilberry, astragalus, capsaicin, and fenugreek. Bromelain, an enzyme derived from pineapple, would be included also.

**Interactions which reduce effectiveness of the drugs:** Blood thinners such as Coumadin inhibit vitamin K metabolism as a mechanism of action (vitamin K is a clotting factor), so supplementation could interfere with the effectiveness of these drugs. It is recommended that people on these drugs not ingest excess amounts of vitamin K-rich foods (see vitamin K in the vitamins, minerals and nutrients section). Although vitamin K-rich foods do not have to be totally avoided, caution is advised not to go overboard. There are case reports of foods such as avocado interfering with the effectiveness of warfarin (Lancet 1991;337:914). Coenzyme Q 10 has been observed in Sweden to reduce effectiveness of Coumadin and change bleeding time in patients on Coumadin (the blood became more prone to clotting).

- 
- 
-

# CONTENTS

## PART I: THE PHYSIOLOGY AND SUBCLINICAL/PATHOLOGICAL CONDITIONS OF THE BODY SYSTEMS

THE PHYSIOLOGY OF THE DIGESTIVE SYSTEM.....	1
DIGESTION PHYSIOLOGY.....	1
MOUTH to ESOPHAGUS.....	1
STOMACH.....	1
SMALL INTESTINE (Duodenum, jejunum, ileum).....	1
LIVER.....	2
PANCREAS.....	2
COLON.....	2
SUBCLINICAL AND PATHOLOGICAL CONDITIONS OF THE GASTRO-INTESTINAL SYSTEM... 5	5
ESOPHAGEAL PROBLEMS.....	5
HEARTBURN.....	5
HIATAL HERNIA.....	6
STOMACH PROBLEMS.....	7
INDIGESTION (DYSPEPSIA).....	7
HYPOACIDITY (HYPOCHLORHYDRIA).....	8
ULCERS.....	9
GASTRITIS.....	10
GALLBLADDER PROBLEMS.....	11
LIVER PROBLEMS.....	12
HEPATITIS.....	12
PANCREAS PROBLEMS.....	14
PANCREATITIS.....	14
SMALL AND LARGE INTESTINE PROBLEMS.....	15
MALABSORPTION PROBLEMS.....	15
MALABSORPTION SYNDROMES.....	17
CELIAC SPRUE.....	17
INFLAMMATORY BOWEL DISEASE (CROHN'S DISEASE AND ULCERATIVE COLITIS) ...	18
DIVERTICULOSIS/DIVERTICULITIS.....	19
IRRITABLE BOWEL SYNDROME (IBS).....	20
GASTRO-INTESTINAL DISTRESS.....	21
CONSTIPATION.....	21
DIARRHEA.....	22
COLIC.....	23
HEMORRHOIDS.....	24
THE PHYSIOLOGY OF THE IMMUNE SYSTEM.....	27
DEFENSE MECHANISMS OF THE IMMUNE SYSTEM.....	27
THYMUS GLAND.....	27
LYMPHATIC SYSTEM.....	27
SALIVARY GLANDS, TONSILS AND ADENOIDS.....	27
STOMACH.....	27
SPLEEN.....	27
LIVER.....	27
MUCUS MEMBRANES OF THE DIGESTIVE, RESPIRATORY, URINARY AND REPRODUCTIVE TRACT.....	28
SMALL INTESTINE.....	28
LARGE INTESTINE.....	28
APPENDIX.....	28
BONE MARROW.....	28
IMMUNE SYSTEM FUNCTION.....	29

WHITE BLOOD CELLS.....	29
CLINICAL APPLICATION.....	30
ANTIGEN-ANTIBODY REACTION.....	30
SUBCLINICAL AND PATHOLOGICAL CONDITIONS OF THE IMMUNE SYSTEM .....	33
IMMUNE PROBLEMS.....	33
COLDS/FLUS .....	33
PEDIATRIC EAR INFECTION.....	34
FEVER.....	35
VACCINATION TOXICITY .....	35
CHRONIC FATIGUE SYNDROME .....	36
FOOD ALLERGIES/SENSITIVITIES .....	37
ENVIRONMENTAL ALLERGIES .....	40
CANDIDIASIS .....	41
PARASITIC INFECTIONS.....	43
HEAVY METAL TOXICITY.....	45
CHEMICAL TOXICITY.....	47
THE PHYSIOLOGY OF THE MUSCULOSKELETAL SYSTEM .....	49
BONES .....	49
BONE DISORDERS .....	50
CARTILAGE.....	50
JOINTS .....	50
JOINT DISORDERS .....	50
MUSCLES .....	51
LIGAMENTS AND TENDONS .....	51
CONNECTIVE TISSUE .....	51
SUBCLINICAL AND PATHOLOGICAL CONDITIONS OF THE MUSCULOSKELETAL AND	
NERVOUS SYSTEM.....	53
MUSCULOSKELETAL PROBLEMS.....	53
MUSCLE CRAMPS/SPASMS.....	53
BACK PAIN.....	54
ARTHRITIS .....	55
OSTEOARTHRITIS.....	55
RHEUMATOID ARTHRITIS.....	57
GOUT .....	59
OSTEOPOROSIS .....	61
FRACTURES/BROKEN BONES .....	63
BONE SPURS .....	64
STRAINS, SPRAINS AND OTHER INJURIES .....	65
INFLAMMATION.....	66
BURSITIS/TENDONITIS.....	67
CARPAL TUNNEL SYNDROME .....	68
HEADACHES .....	69
NERVE PROBLEMS .....	72
SCIATICA.....	72
NEURITIS/NEURALGIA.....	73
SHINGLES .....	73
THE PHYSIOLOGY OF THE CARDIORESPIRATORY SYSTEM .....	75
THE RESPIRATORY SYSTEM.....	75
RESPIRATORY DISORDERS .....	76
THE CARDIOVASCULAR SYSTEM .....	76
SUBCLINICAL AND PATHOLOGICAL CONDITIONS OF THE CARDIOVASCULAR SYSTEM ...	79
HEART PROBLEMS .....	79
HEART DISEASE.....	79
MITRAL VALVE PROLAPSE.....	84
RAYNAUD'S DISEASE.....	84
HYPERTENSION .....	85
SUBCLINICAL AND PATHOLOGICAL CONDITIONS OF THE RESPIRATORY SYSTEM.....	89
RESPIRATORY PROBLEMS .....	89

ASTHMA.....	89
HAYFEVER .....	91
SINUS INFECTION (Sinusitis).....	92
COUGHS .....	93
BRONCHITIS .....	94
PNEUMONIA .....	95
THE PHYSIOLOGY OF THE URINARY SYSTEM.....	97
THE KIDNEYS .....	97
THE URETERS.....	98
THE BLADDER.....	98
THE URETHRA.....	98
SUBCLINICAL AND PATHOLOGICAL CONDITIONS OF THE URINARY SYSTEM.....	99
KIDNEY AND BLADDER PROBLEMS.....	99
URINARY TRACT INFECTIONS .....	99
KIDNEY STONES.....	100
THE PHYSIOLOGY OF THE EYE.....	103
EYE DISORDERS.....	103
SUBCLINICAL AND PATHOLOGICAL CONDITIONS OF THE EYES.....	105
VISION PROBLEMS.....	105
EYE PROBLEMS - .....	105
THE PHYSIOLOGY OF THE EAR, NOSE, & THROAT.....	109
THE EAR.....	109
THE NOSE .....	109
THE THROAT .....	109
SUBCLINICAL AND PATHOLOGICAL CONDITIONS OF THE EARS.....	111
EAR PROBLEMS .....	111
EAR INFECTIONS (Otitis Media).....	111
MENIERE’S DISEASE.....	112
TINNITUS .....	112
THE PHYSIOLOGY OF THE ENDOCRINE SYSTEM.....	115
THE ADRENAL GLANDS.....	115
PHYSIOLOGY OF THE ADRENAL GLAND .....	115
THE THYROID GLAND.....	118
PHYSIOLOGY OF THE THYROID GLAND .....	118
THE PITUITARY GLAND.....	119
THE HYPOTHALAMUS.....	120
THE THYMUS GLAND.....	120
THE PINEAL GLAND.....	121
SUBCLINICAL AND PATHOLOGICAL CONDITIONS OF THE ENDOCRINE SYSTEM.....	123
ADRENAL PROBLEMS .....	123
HYPOADRENIA.....	123
THYROID PROBLEMS .....	124
HYPOTHYROIDISM.....	124
HYPERTHYROIDISM (Grave’s Disease).....	126
PANCREAS PROBLEMS.....	127
HYPOGLYCEMIA.....	127
DIABETES .....	128
THYMUS PROBLEMS.....	130
DECREASED THYMUS FUNCTION .....	130
THE PHYSIOLOGY OF THE MALE REPRODUCTIVE SYSTEM.....	133
MALE REPRODUCTIVE ORGANS.....	133
HORMONAL CONTROL.....	133
SUBCLINICAL AND PATHOLOGICAL CONDITIONS OF THE MALE REPRODUCTIVE SYSTEM.....	135
MALE GENITOURINARY SYSTEM.....	135
PROSTATE ENLARGEMENT (BENIGN PROSTATIC HYPERTROPHY (BPH) or HYPERPLASIA) .....	135
PROSTATITIS .....	136

PROSTATE CANCER .....	136
IMPOTENCE.....	138
SEXUALLY TRANSMITTED DISEASES (STD).....	139
THE PHYSIOLOGY OF THE FEMALE REPRODUCTIVE SYSTEM.....	143
FEMALE REPRODUCTIVE ORGANS .....	143
HORMONAL CONTROL.....	143
HORMONES .....	143
THE MENSTRUAL CYCLE .....	144
SIGNS AND SYMPTOMS OF ESTROGEN/PROGESTERONE IMBALANCES.....	144
MENOPAUSE .....	145
SUBCLINICAL AND PATHOLOGICAL CONDITIONS OF THE FEMALE REPRODUCTIVE SYSTEM.....	147
FEMALE PROBLEMS .....	147
DYSMENORRHEA .....	147
AMENORRHEA .....	148
PREMENSTRUAL SYNDROME .....	149
FIBROCYSTIC PROBLEMS.....	151
FIBROCYSTIC BREAST DISEASE (FBD).....	151
UTERINE AND OVARIAN PROBLEMS .....	152
UTERINE FIBROIDS .....	152
ENDOMETRIOSIS .....	153
CERVICAL DYSPLASIA.....	154
OVARIAN CYSTS.....	155
VAGINAL PROBLEMS .....	156
VAGINITIS (Vaginal Infections) .....	156
MENOPAUSAL PROBLEMS .....	157
MENOPAUSE .....	157
SUBCLINICAL AND PATHOLOGICAL CONDITIONS FOR MISCELLANEOUS CONDITIONS ...	161
EDEMA .....	161
INSOMNIA .....	161

## **PART II: NUTRIENT APPLICATIONS AND RESEARCH**

NUTRIENT APPLICATIONS .....	163
ALFALFA .....	163
ALOE VERA.....	163
AMINO ACIDS .....	164
ANISE STAR SEED.....	164
ANTIOXIDANTS .....	164
APPLE PECTIN .....	167
ARTICHOKE .....	167
BARBERRY (Berberis vulgaris).....	168
BASIL.....	168
BAYBERRY.....	168
BEETS .....	168
BERBERINE .....	168
BETA-CAROTENE .....	168
BETA-GLUCANS.....	169
BETAINE .....	169
BILBERRY.....	169
BLACK CHERRY.....	169
BLACK COHOSH.....	170
BLACK CURRANT SEED OIL .....	170
BLACK RADISH ROOT .....	170
BLACK WALNUT.....	170
BLESSED THISTLE.....	170
BLUE COHOSH.....	170
BLUE VERVAIN .....	171

BUCKTHORN BARK.....	171
BUCKWHEAT.....	171
BUCKWHEAT GRASS JUICE .....	171
BURDOCK ROOT.....	171
BUTTERNUT BARK.....	171
BUTYRIC ACID (formed from fiber).....	171
CABBAGE.....	172
CALENDULA.....	172
CAPRYLIC ACID.....	172
CARNITINE.....	172
CARROTS.....	173
CASCARA SAGRADA .....	173
CATNIP.....	173
CAT'S CLAW.....	173
CAYENNE.....	173
CELERY.....	174
CHAMOMILE.....	174
CHICKWEED.....	174
CHINESE HERBS.....	174
CHLORELLA.....	175
CHLOROPHYLL.....	175
CHOLINE.....	175
CHONDROITIN SULFATE A (trachea) .....	176
CHROMIUM.....	176
CINNAMON.....	176
CITRUS FRUITS.....	176
CITRUS SEED EXTRACT.....	176
CLEAVERS.....	177
CLOVES.....	177
COENZYME Q10.....	177
COLLINSONIA.....	177
CORN SILK.....	178
CRANBERRY.....	178
CRANESBILL.....	178
CREATINE.....	178
DAMIANA.....	178
DANDELION.....	179
DEGLYCYRRHIZINATED LICORICE POWDER (DGL).....	179
DEVIL'S CLAW.....	179
DONG-QUAL.....	179
DULSE.....	179
ECHINACEA.....	180
ELUTHERO (Siberian Ginseng).....	180
ENZYMATIC AIDS.....	181
ESSENTIAL FATTY ACIDS (EFA'S).....	182
EUCALYPTUS.....	184
EVENING PRIMROSE OIL.....	185
EYEBRIGHT.....	185
FENNEL SEED.....	185
FENUGREEK SEED.....	185
FEVERFEW.....	185
FIBER.....	185
FISH OIL.....	186
FO-TI.....	186
FRUIT.....	186
GARLIC (Allium sativum).....	186
GENTIAN.....	188
GINGER ROOT.....	188

GINKGO BILOBA.....	188
GINSENG.....	189
GLANDULARS.....	189
GLUCOSAMINE SULFATE.....	190
GLUTAMINE.....	191
GLYCINE.....	192
GOLDENSEAL ( <i>Hydrastis canadensis</i> ).....	193
GOTU KOLA.....	193
GUAR GUM.....	193
GYMNEMA SYLVESTRE.....	193
HAWTHORN BERRIES.....	193
HESPERIDIN.....	194
HONEY.....	194
HORSETAIL ( <i>Shavegrass</i> ).....	194
HYDROCHLORIC ACID (HCL).....	195
INOSITOL.....	195
IRISH MOSS.....	196
JUNIPER BERRIES.....	196
KELP.....	196
L-GLUTAMINE.....	196
LACTOBACILLUS.....	197
LACTOBACILLUS ACIDOPHILUS.....	197
LACTOBACILLUS BIFIDUS.....	197
LACTOBACILLUS BULGARICUS.....	197
LECITHIN.....	197
LICORICE ROOT.....	198
MARSHMALLOW.....	198
MICROCRYSTALLINE HYDROXYAPATITE (MCHC).....	198
MILK THISTLE ( <i>Silybum Marianum</i> ).....	198
MONTMORILLINITE CLAY ( <i>Selicia</i> ).....	199
MOTHERWORT.....	199
MYRRH GUM.....	199
N-ACETYL-CYSTEINE.....	199
N-ACETYL-GLUCOSAMINE.....	200
NETTLE.....	200
OLIVE LEAF.....	200
OREGON GRAPE ROOT ( <i>Berberis aquafolium</i> ).....	201
OREGANO.....	201
OX BILE (BILE SALTS).....	201
PARSLEY.....	201
PASSION FLOWER.....	201
PAU d' ARCO.....	202
PEPPERMINT.....	202
PHYTOCHEMICALS.....	202
PHYTOESTROGENS.....	202
PLANTAGO (PLAINTAIN).....	203
PLEURISY ROOT.....	203
PRIMROSE OIL.....	203
PROANTHOCYANIDINS.....	203
QUASSIA.....	203
QUERCETIN.....	203
RED BEET ROOT.....	204
RED RADISH.....	204
RUTIN.....	204
SKULLCAP.....	204
SLIPPERY ELM.....	205
SODIUM ALGINATE.....	205
ST. JOHN'S WORT.....	205

STINGING NETTLE.....	205
TILLANDSIA.....	206
THYME .....	206
UREA (carbamide) .....	206
UVA URSI.....	206
VALERIAN ROOT .....	207
VANADYL SULFATE .....	207
WATERCRESS .....	207
WHITE WILLOW BARK.....	207
WILD YAM.....	208
YARROW.....	208
YOGURT.....	208
YOHIMBE BARK.....	209
BASIC NUTRITIONAL INFORMATION: VITAMINS .....	211
VITAMIN A .....	211
VITAMIN B COMPLEX .....	212
VITAMIN B-1 (Thiamine or thiamin).....	213
VITAMIN B-2 (Riboflavin).....	213
VITAMIN B-3 (Niacin).....	213
VITAMIN B-5 (Pantothenic Acid).....	214
VITAMIN B-6 (Pyridoxine).....	214
VITAMIN B-12 (Cyanocobalamin).....	216
B VITAMIN - FOLIC ACID .....	216
B VITAMIN - BIOTIN.....	217
VITAMIN C (ASCORBIC ACID) .....	217
VITAMIN D .....	219
VITAMIN E.....	219
VITAMIN F (UNSATURATED FATTY ACIDS) .....	220
VITAMIN K .....	220
VITAMIN P (BIOFLAVONOIDS).....	220
ANTIOXIDANTS .....	221
MINERALS .....	225
BORON .....	225
CALCIUM .....	226
CHLORIDE .....	226
CHROMIUM.....	227
COPPER .....	227
IODINE.....	227
IRON.....	227
MAGNESIUM.....	228
MANGANESE .....	229
MOLYBDENUM .....	229
PHOSPHORUS .....	229
POTASSIUM.....	230
SELENIUM .....	230
SILICON.....	231
SODIUM.....	231
SULFUR .....	231
VANADIUM .....	231
ZINC .....	232

## **PART III: INTERACTIONS**

HERBAL NUTRIENTS/VITAMINS/MINERALS AND DRUG/NUTRIENT INTERACTIONS.....	233
ALL DRUGS .....	233
ACNE MEDICINE .....	234
ALCOHOL .....	234
ALCOHOL-ABUSE DRUGS.....	235

ALUMINUM-BASED ANTACIDS.....	235
ALZHEIMER’S DRUGS .....	235
ANTIBIOTICS .....	236
ANTI-HISTAMINES.....	236
ARTHRITIS DRUGS .....	236
ASTHMA DRUGS .....	238
BIRTH CONTROL PILLS.....	238
BLOOD PRESSURE DRUGS.....	238
BLOOD THINNERS .....	241
CANCER DRUGS.....	241
CHOLESTEROL DRUGS.....	242
CORTICOSTEROIDS.....	242
DEPRESSION DRUGS.....	243
DIABETIC DRUGS .....	244
EPHEDRINE & PSEUDOEPHEDRINE.....	244
EPILEPSY DRUGS.....	244
ETIDRONATE .....	245
GOUT DRUGS.....	245
HEART DRUGS.....	246
HORMONE REPLACEMENT THERAPY .....	247
LAXATIVES .....	247
PARKINSON’S DRUGS.....	247
POTASSIUM PRESCRIPTIONS.....	247
SLEEPING PILLS .....	248
THYROID HORMONE .....	248
TRANQUILIZERS .....	248
TUBERCULOSIS DRUGS .....	248
ULCER DRUGS.....	249
ULCERATIVE COLITIS .....	250
URINARY TRACT INFECTION DRUGS.....	250
REFERENCES .....	251

## **PART IV: BIBLIOGRAPHY AND INDEX**

BIBLIOGRAPHY.....	253
INDEX.....	255