PORPHYRAZYME
Heavy Metal Chelation & Detoxification

Porphyrazyme (formerly named Chelazyme) consists of two major ingredients: plant chloroplast and vitamin C (ascorbate). Plant chloroplasts are subcellular organelles where photosynthesis occurs. Chloroplasts contain high concentrations of the green pigments, chlorophyll, found in plants and algaes. Chlorophyll is an example of a prophyrin ring compound, hence the name Porphyrazyme. During photosyntheses, conversion of light and carbon dioxide into glucose is mediated by chlorophyll and many other components of chloroplasts. However, free radicals are also formed, which is why chloroplasts have high levels of antioxidants. These other components of chloroplasts stablize chlorophyll, preventing oxidative damage, and prolonging the shelf life of Porphyrazyme tablets. Some of these more important components are present in an listed on the label of Porphyrazyme.

Chlorophyllin - A form of chlorophyll lacking the phytol side chain, making this prophyrin more soluble in water.

Galactoglycerides - A glycolipid (combination sugar and lipid) consisting of galactose and glycerol combined with other molecules. Galactoglycerides are an abundant portion of chloroplast membranes. In mammalian membranes they provide hydrophilic areas for membrane transport.

Chlorophyll ("a", "b") - The green pigment of plants consists primarily of two forms of chlorophyll: "a" and "b". Both contain porphyrin rings, magnesium and phytol (a long chain alcohol). The difference between "a" and "b" is a porphyrin ring side chain modification. Magnesium is loosely bound in the middle of the ring structure. Chlorophyll "a" absorbs mostly short wavelengh (violet) light, while chlorophyll "b" absorbs mostly long wavelength (red) light.

Porphyrin rings have been engineered by nature to form complexes with metal ions. For example, heme in hemoglobin chelates iron.

Phospholipids - Triglycerides with one fatty acid replaced by a phosphate group are termed phospholipids. Other compounds can then be attached to the phosphate to form lecithin (choline), and a host of other compounds such as cephalins, lipositols, plasmalogens, phosphtidates, sphingomyelins and others. Choline, inositol, ethanolamine and serine are the major additions to phospholipids. Phospholipids make up the bulk of cell membranes, and are abundant in nervous system tissues. Recently, phospholipids have been shown to be important control compounds for trans-membrane transport of nutrients and wastes.

Carotenoids - These highly-colored lipids were named after a carrot isolate in 1831. Over 80 naturally-occurring carotenoids are known, but all are similar in structure. Porphyrazyme

contains alpha and beta carotenes. Beta carotene is the most important quencher of singlet oxygen (a free radical produced during photosynthesis) known to science. This antioxidant feature accounts for anticancer and detoxification attributes. It also functions as a precursor for vitamin A (retinol) and can deliver energy from certain wavelengths of light to chlorophyll.

Sulfolipids - Similar to phospholipids, sulfolipids contain a sulfate instead of phosphate. Their function is still obscure, but large amounts are found in nervous system tissues.

Plastoquinones (abc) - These molecules are the plant equivalent of coenzyme Q10 and function by transporting energy in he form of electrons from photosynthetic processes in membranes. Their structure is almost identical to coenzyme Q10, except for a shorter side chain.

Tocopherols - Tocopherols are forms of vitamin E (alpha, beta, gamma and delta isomers) that protect membranes form damage by free radicals.

Menadione - Also known as vitamin K3, menadiones are used by plants in energy-transfer reactions, similar to coenzyme Q10. In mammals, vitamin K is necessary for proper blood clotting. A deficiency causes a prolonged prothrmobin time and tendency to bleeding and bruising.

Cytochromes B6 & f - Present attached to chloroplast membrans in a 1:100 and 1:400 ratio to chlorophyll, respectively. Cytochromes contain heme (porphyrin) iron which participates in energy-transfer reactions, similar to cytochromes in mammalian mitochondria.

Plastocyanine - A cuproprotein present in a ratio of 1:600 with chlorophyll, plastocyanine is a similar to mammalian mitochondrial cytochrome a. Plastocyanine contains two hemin (porphyrin) rings containing one copper each per molecule.

Feridoxin - This iron-sulfur protein (non-porphyrin) transfers energy to regenerate NADPH needed for photosynthesis.

Dark green, lefty vegetables are a starting point for enrichment of chloroplasts/porphyrins by our in-house Biological Processing facility. The resulting vegetable leaf extract is combined with vitamin C, another potent heavy metal detoxifier. Porphyrazyme is not just another chlorophyll product, but a concentrated vegetable extract rich in porphyrins. Porphyrazyme is suitable for strict vegans.

Porphyrazyme is intended to complex and remove heavy metals from body tissues in a safe manner, especially for those who will not or cannot consume large amounts of fresh fruits and vegetables. In fact, Biotics Research Corporation scientists refer to Porphyrazyme as "Instant Salad Tablets."

Porphyrazyme binds heavy metals by replacement of the magnesium in the center of the porphyrin ring. Most heavy metals have a stronger affinity for porphyrin rings than magnesium,

which means that when chlorophyll is exposed to a heavy metal, the magnesium will be substituted, forming a stable heavy metal-porphyrin chelate.

The ability of Porphyrazyme to chelate heavy metals was demonstrated in vitro. Porphyrazyme powder was placed into dialysis bags with a low molecular weight cutoff (to retain porphyrins). Known amounts of soluble heavy metals were added to the liquid surrounding the dialysis bags. Concentrations ranged from 10 to 30 parts per million, which is a physiologically toxic dose. after a period of time (overnight), the concentration of heavy metal ions remaining in solution were measured by our atomic absorption spectrophotometer. Results showed that Porphyrazyme was able to preferentially complex most of the toxic heavy metals it encountered (Table 1 below). The only concern to health would be chelation of chromium,but since the experiemnt used chromium chloride, and since chromium in human bodies is bound to GTF molecules, there should be no leaching of chromium in vivo by Porphyrazyme.

INVESTIGATIONAL DATA ON PORPHYRA-ZYME

	Initial Concentration	**After Dialysis against a solution of Phorphyra-zyme**	**Amount Complexed**	**Percent**
Lead	20 ppm	4.8 ppm	15.2 ppm	76%
Mercury	10 ppm	0.8 ppm	9.2 ppm	92%
Cobolt	30 ppm	3.4 ppm	26.6 ppm	88%
Cadmium	15 ppm	3.6 ppm	11.4 ppm	76%
Arsenic	10 ppm	1.4 ppm	8.6 ppm	86%
Aluminum	20 ppm	7.0 ppm	13.0 ppm	65%
Nickel	10 ppm	3.3 ppm	6.7 ppm	67%
Chromium	20 ppm	3.8 ppm	16.2 ppm	81%

Relative efficiency of binding Hg>Co=As>Cr>Pb=Cd>Al=Ni

TABLE 1

To be effective in vivo, a heavy metal chelator must both bind strongly to heavy metals and also allow removal of the complex from the body. Humans possess a large metabolic machinery to synthesize, degrade and excrete porphyrin rings, mostly for heme groups in hemoglobin, myoglobin and cytochromes. Bilirubin is one breakdown product of prophyrin rings in humans. Dietary porphyrin rings (like chlorophyll) are absorbed to varying degrees, metabolized and excreted. Ingestion of Porphyrazyme increases uptake of exogenous porphyrin rings. While in circulation and/or tissues, these porphyrin rings have the opportunity to exchange magnesium for heavy metals. When metabolized, the heavy metal remains chemically bound to porphyrin rings and their breakdown products, and can be excreted via urine and feces out of the body.

Vitamin C has been shown to reduce body burden of toxic heavy metals (lead, cadmium, merury) in animals and humans since 1936. Mechanisms include: 1) direct chelation and excretion; 2) protective antioxidant effects; 3) specific detoxifying emzyme stimulations; or 4) indirect effects on adrenal and thyroid hormones (affecting overall metabolism and excretion).

In addition to detoxification of heavy metals, porphyrin rings may be used as a form of oral chelation for arterial disease. Here the concept is to leach calcium out of plaque deposits in arteries, improving blood flow. Equally (or more so) valid is the chelation of free heavy metals that catalyze free radical formation, which is a major propagating event in plaque formation.

This feature (improvement of blood flow from blocked arteries) has been documented in humans. A group of podiatristis selected 10 patients (47-76 years of age) with symptoms of coldness of feet to intermittent claudication. A Pulse Volume Recorder measured pedal (foot) circulation. Five patients received Porphyrazyme (2) patients @ 2 tabs qid, 3@ 1 tab qid). Four patients, with the worst circulation, received 3 Porphyrazyme qid and 1 Intenzyme Forte tab qid. One patient received 2 Porphyrazyme qid and one Intenzyme Forte qid. All supplements were taken on an empty stomach, at least one hour before meals for 6 weeks. Each patient also received one Multi-Mins tablet with dinner daily.

Repeat pedal circulation determinations at 6 weeks found 6/10 (60%) patients markedly improved. After twelve weeks, 8/10 (80%) patients showed marked improvement. Patients taking 1 or 2 Porphyrazyme tabs qid (all showed improvements) were reduced to tid. After eighteen weeks, all but one of the patients showed improvement. The patients with reduced dosage maintained their improved status. The amounts of reduction were similar whether Intenzyme Forte was added or not.

One patient had two leg ulcers of one year duration heal completely shortly after the start of the study. Three patients with poor balance and diminished mental alertness noted marked improvement. Three patients noticed nail stability (less breakage and splintering). Complaints of cold hands and feet ceased after two weeks.

Although this study was not double-blind, placebo-controlled, it indicated that oral chelation by Porphyrazyme improved peripheral circulatoin in patients with intermittent claudication and coldness of extremities.