



Dr. Heather Fox DNM PhD DAC

Doctor of Natural Medicine

1414 Montague Street

Regina, SK

Ph. 522-2407

The Following is a compiled resource paper discussing a variety of Intravenous Therapies including Chelation therapy, Heavy Metal Detoxification, and IV Nutrient Therapy.

Chelation Therapy

Two-time Nobel Prize winner, Dr. Linus Pauling had this to say about Chelation:

"Chelation therapy is far safer and much less expensive than surgical treatment of atherosclerosis. Chelation therapy might eliminate the need for bypass surgery and is equally valid when used as a preventative treatment".

Kelowna (Park Place) Clinic Chelation therapy (pronounced Key-Lay-Shun) is derived from the Greek word chele meaning claw of a crab. It refers to how, in a pincer like fashion, a chelating agent grabs onto an electrically charged mineral ion such as lead, copper, iron or calcium. EDTA is a chelating agent that was developed in Germany in the 1930's and was at first used for treatment of lead poisoning and in the 1950's already Doctors observed that other medical problems such as Arthritis or Atherosclerosis also improved.

Quote from the book: 'The Chelation Way' by Dr. Morton Walker

Even with our medical establishment's non-recognition of Chelation's best effect, the treatment's most important application is for preventing or reversing heart and artery pathology derived from diminished blood circulation. The chelating agent, called EDTA, removes toxic metals, improves circulation, enhances the immune system and inhibits the creation of "free radicals". Free Radicals are now believed by many scientists to be an important contributing cause of atherosclerosis (hardening of the arteries), cancer, diabetes, alzheimer's and other diseases of aging.

Quote from: Dr. Peter J. Van Der Schaar, Cardiac Surgeon, Director, International Biomedical Center, The Netherlands. Chairman of American Board of Chelation Therapy.

"I now achieve more lasting results with less risk, enhancing the benefits of surgery, and often avoiding surgery, by providing chelation therapy for my patients."

Other Benefits of Chelation

Quoted from the book 'Forty Something Forever' by: Arlene Brecher

- Reduction of liver-produced cholesterol
- Lowered insulin requirements in diabetics
- Lowered blood cholesterol levels
- Reduced high blood pressure
- Normalization of cardiac arrhythmias
- Relief from leg muscle cramps
- Reduction in allergic symptoms
- Normalized weight
- Improved psychological and emotional status
- Enhanced sensory input: better sight, hearing, taste
- Fewer excessive heart contractions
- Lessened varicose vein pigmentation
- Lightened age spots
- Fewer aches and pains, arthritic and otherwise
- Less reliance on pain medication
- Hair loss stopped and reversed
- Reversal of impotence
- Alzheimer's Disease symptoms reversed
- Reduced need for diuretics
- Cold extremities warmed
- Chronic Fatigue Syndrome overcome
- Memory, and mental concentration improved
- Post-cataract surgery vision loss restored
- Cosmetic changes, including more lustrous hair, added eye sparkle, stronger unsplit nails, better skin color, fewer visible wrinkles and a more youthful appearance.

Chelation therapy involves the intravenous infusion of EDTA (ethylene diamine tetraacetic acid) over a course of treatments in a doctor's office. EDTA is a synthetic amino acid, which has the ability to attach itself to metals and minerals, forming a particular kind of bond called a chelate. Once the chelate is formed it

is naturally excreted from the body. Essentially, chelation therapy “washes out” heavy metals and minerals from the body.

Ethylenediaminetetraacetic acid ("EDTA") is a synthetic amino acid first used in the 1940's for treatment of heavy metal poisoning. It is widely recognized as effective for that use as well as certain others, including emergency treatment of hypercalcemia and the control of ventricular arrhythmias associated with digitalis toxicity. Studies by the National Academy of Sciences/National Research Council in the late 1960's indicated that EDTA was considered possibly effective in the treatment of occlusive vascular disorders caused by arteriosclerosis.

Clinical experience with EDTA chelation therapy has convinced substantial numbers of licensed physicians in North America that it is a safe and effective treatment for atherosclerotic vascular disease, as it consistently improves blood flow and relieves symptoms associated with the disease in greater than 80% of the patients treated. As members of the medical profession are generally aware, the pathogenesis of atherosclerotic disease is extraordinarily complex. The scientific principles underlying the efficacy of EDTA chelation therapy in impeding each step of the disease process are beyond the scope of this overview, but they are elaborated upon in the many published clinical studies and research papers available.

In its simplest terms, the rationale for its efficacy is that EDTA, in binding ionic metal catalysts and removing them from the body, reduces subsequent abnormal production of oxygen free radical reactive molecules and molecular fragments which react destructively with other molecules. See, E. M. Cranton, J. P. Frackelton, *Free Radical Pathology in Age-Associated Diseases: Treatment with EDTA Chelation, Nutrition, and Antioxidants*, **Journal of Advancement in Medicine**, [Vol. 2, Nos. 1, 2, Spring/Summer, 1989.](#)¹

There is now widespread agreement that EDTA removes metallic catalysts which cause excessive oxygen free radical proliferation, thereby reducing pathological lipid peroxidation of cell membranes, DNA, enzyme systems and lipoproteins and allowing the body's natural healing mechanisms to halt and often reverse the disease process.

Steinberg, et al., state in the April 6, 1989, **New England Journal of Medicine**, 1989; 320(14):915-924, concerning *Modifications of Low-density Lipoprotein That Increase Its Atherogenicity* through free radical peroxidation, "oxidative modification is absolutely dependent on low concentrations of copper or iron in the medium and is therefore completely inhibited by ethylenediaminetetraacetic acid (EDTA)."²

Chelation therapy is considered by the physicians who utilize it to be an effective first step alternative to surgical treatment for atherosclerotic vascular disease in most cases. In the instances where a physician believes that bypass surgery or the interventional cardiac catheterization techniques of thrombolysis and balloon angioplasty are more appropriate, he or she will refer those patients out. These alternatives to chelation therapy though are not without their respective detractors and attendant risks.

In September 1978 the Office of Technology Assessment ("OTA"), a branch of the United States Congress, aided by an advisory board composed of leading medical and university school faculty, published a report entitled *Assessing the Efficacy and Safety of Medical Technologies*. One portion of that report discussed the efficacy and safety of surgery for coronary artery disease, concluding as follows:

Coronary artery bypass surgery is based on a scientific rationale and may be of measurable benefit to some patients. It is usually performed for angina pectoris and appears to give substantial relief from symptoms, but the extent to which this relief is an effect of surgery is not known. *Limited studies suggest that coronary bypass surgery improves life expectancy significantly for only a small number of patients*, with a particular type of coronary artery disease. *Controlled studies have shown no improvement in life expectancy for patients studied* (emphasis added). *Id.* at page 44.³

The importance of this analysis is its recognition, though over 70,000 operations were performed in 1977, that the benefits of such surgery have yet to be demonstrated.⁴

Another article in the **New England Journal of Medicine** (March 22, 1984) reported upon myocardial infarction and mortality in the coronary artery surgery study (CASS) randomized trial, and summarized as follows in the Abstract:

ABSTRACT: There were no statistically significant differences in the survival rate or in the myocardial infarction rate between subgroups of patients randomly assigned to medical and to surgical therapy when they were analyzed according to initial group assignment, number of diseased vessels, or ejection fraction. Therefore, as compared with medical therapy, coronary bypass surgery appears neither to prolong life nor to prevent myocardial infarction in patients who have mild angina or who are asymptomatic after infarction in the five-year period after coronary angiography.⁵

The necessity of heart surgery and the scheduling of such surgery have undergone substantial criticism of late by many in the medical community. Despite this criticism, in 1981 an estimated 110,000 patients underwent bypass surgery. By 1983 the annual number of operations had increased to 191,000, and by 1989 the number had soared to over 368,000.⁶

As stated by Dr. Thomas A. Preston, professor of cardiology at the University of Washington School of Medicine and chief of cardiology at Pacific Medical Center:

[Coronary-bypass surgery] is heralded by the popular press, aggrandized by our profession, and actively sought by the consuming public. It is the epitome of modern medical technology. Yet, as it is now practiced, its net effect on the nation's health is probably negative. The operation does not cure patients, it is scandalously overused, and its high cost drains resources from other important areas of need.

Fully half of the bypass operations performed in the United States are unnecessary. A decade of scientific study has shown that except in certain well-defined situations, bypass surgery does not save lives or even prevent heart attacks: *Among patients who suffer from coronary-artery disease, those who are treated without surgery enjoy the same survival rates as those who undergo open-heart surgery* (emphasis added). **MD Magazine**, Feb. 1995.

In an article entitled *The Appropriateness of Performing Coronary Artery By-Pass Surgery* published by the American Medical Association in **JAMA** 1988, 260: 505-509, the authors report the results of a randomized study conducted to determine the level of judiciousness currently being applied by physicians in performing coronary artery bypass surgery. The authors report that *only fifty-six percent (56%) of the surgeries were performed for appropriate reasons*. As stated in the abstract to this article, "eliminating the performance of [such] inappropriate procedures may lead to reductions in health care expenditures or to improved patient outcomes."

Balloon angioplasty is an alternative to venous grafting which is enjoying increased popularity among vascular surgeons. Experience with this technique, though, has shown that serious complications, including permanent renal failure, occur in up to 8% of cases and that technical failure rates for iliac and femoral angioplasties occur in up to 50% of cases.⁷ Moreover, it must be remembered that both this technique and venous grafting are very point specific, in distinct contrast to chelation therapy, which benefits the entire vascular system. Furthermore, the costs associated with the various treatment modalities are widely disparate. A typical bypass surgery costs the patient in excess of \$30,000.00, the usual balloon angioplasty over \$12,000.00, and an average course of chelation treatments \$3,000.00 to \$5,000.00, including ancillary costs.

The scientific rationale of chelation therapy is demonstrated in the before noted article of E. M. Cranton, M.D. and J. P. Frackelton, M.D. As stated in the Abstract:

"Recent discoveries in the field of free radical pathology provide a coherent, unifying scientific basis to explain the many and diverse benefits reported from treatment with EDTA chelation therapy. The free radical concept provides a scientific basis for treatment and prevention of the major causes of disability and death, including arteriosclerosis, dementia, cancer, arthritis and numerous other diseases. EDTA chelation therapy, nutritional supplementation, physical exercise and moderation of health destroying habits all have common therapeutic mechanisms which reduce free radical causes of age-related diseases."

Chelation therapy, like bypass surgery and angioplasty, is based upon a scientific rationale and is of measurable benefit to patients. There is no reason why surgery should be condoned, while chelation therapy is often condemned simply because it has not heretofore undergone large-scale, double-blind, placebo-controlled trials.

As elaborated upon in the OTA report, *only 10 to 20 percent of all procedures currently used in medical practices have been shown to be efficacious by controlled trial.*⁸

The efficacy of chelation therapy has been clinically demonstrated to thousands of doctors through positive results in hundreds of thousands of cases where this treatment was utilized. One pilot double blind study has already been completed with strongly favorable results.⁹

The safety of this therapy, when properly administered, is not an issue. It is estimated that physicians utilizing the protocol developed by the American College for Advancement in Medicine nationally have safely treated over 500,000 patients with this

therapy.¹⁰ No reported fatalities have occurred in the United States when the ACAM protocol has been followed. Whenever chelation is used in its widely-accepted role to combat lead poisoning, the dosages given even to children are administered much more rapidly than those administered to adults under this protocol. The risks associated with surgical procedures are far greater by comparison.

The Food and Drug Administration determined that EDTA chelation therapy was safe prior to approving the Investigational New Drug protocol for the ongoing double-blind placebo-controlled studies.

It is the treating, clinical physician who is best acquainted with the patient's medical history, examination results, condition and needs. It is the attending physician who is in the best position to assess the condition (medical, socioeconomic, and psychological) of the patient as well as what constitutes the best treatment for the patient. Despite criticism in the form of opinions from physicians who characteristically have never utilized the treatment modality, not a single valid study has ever been shown to support or warrant such distraction.

Under current treatment protocols, EDTA chelation therapy is safe and relatively free of side effects which may include, but are not limited to, discomfort at the injection site, thrombophlebitis, fatigue, hypocalcemia, muscle cramps, nausea, vomiting, allergic reaction (although rare), nephrotoxicity (although rare), congestive heart failure, liver disease, anticoagulation, lowering of blood sugar levels, mineral loss, shock (although rare), infection, and generalized complaints. Chelation therapy patients are advised to take a comprehensive approach to their treatment and health, including diet, exercise, stress management programs and dietary supplements. As with any other medical treatment, patients should insure that their treating physicians have appropriate training and credentials for administration of EDTA chelation therapy.¹¹

Despite the lack of controlled scientific studies as proof of its effectiveness, physicians have used EDTA chelation therapy for over fifty years to treat such related diseases as cardiovascular disease, diabetic arterial disease, decreased mental function from vascular disease and intermittent claudication (leg pain with exercise). Many of these doctors also use EDTA in preventive medicine.

There an in-depth wealth of information from reliable sources available on the web about chelation; some useful web sites include:

¹¹<http://www.acam.org/> The American College for Advancement in Medicine (ACAM) provides a position paper and further information on chelation.

<http://nccam.nih.gov/news/2002/chelation/pressrelease.htm/> "NIH Launches Large Clinical Trial on EDTA Chelation Therapy for Coronary Artery Disease"
<http://216.185.112.5/presenter.jhtml?identifier=3000843> American Heart Association. Questions and answers about chelation therapy.

HEAVY METAL DETOXIFICATION

Mercury Toxicity and the Use of DMPS Chelation

by John C. Cline, M.D., B.Sc., C.C.F.P.

Medical Director -- Oceanside Medical Clinic

History of Dental Amalgams

For the past two centuries, mercury amalgam use in dentistry has increased in popularity as the preferred tooth filling material.(1,2,3) However, when mercury amalgam was initially introduced into North America in the 1830s, its use was vehemently opposed by the dental licensing authority, the American Society of Dental Surgeons and official policies were adopted to prohibit the use of this material. Their concern was focussed upon the safety of placing mercury into humans since many toxic effects of mercury were well known; including dementia and loss of motor coordination. In spite of this official prohibition, several dentists continued to use mercury amalgam and some were subsequently suspended for malpractice. The popularity of this inexpensive, durable and easy to work with material continued to rise amongst dentists and by 1856, there were so many dentists using mercury amalgam that the American

Society of Dental Surgeons was disbanded by overwhelming opposition to their policy surrounding amalgam fillings. Following this, in 1859 the American Dental Association was founded on the premise that mercury amalgam was a safe and desirable tooth filling material. Because of the low cost of amalgam, dentistry was now available to the masses for the first time. By 1895, the mercury amalgam mixture of metals was modified and this formula continues to be used to this day, with a typical mixture containing 50% metallic mercury, 35% silver, 9% tin, 6% copper, and a trace of zinc. Mercury amalgam continues to be the material preferred by 92% of dentists for restoring posterior teeth.(4,5) and over one hundred tons of mercury is now used in dentistry in the U.S. each year.

Mercury release from dental amalgams

The basic premise for regarding the amalgam filling as safe was the assumption that the amalgamation process resulted in a stabilization of the normally volatile mercury. This premise has now been shown to be entirely false. Since the 1980s, it has been well established that mercury vapor is continuously released from amalgam fillings. The release of this vapor into the mouth increases immediately after chewing(6) or tooth brushing(7) and can result in a daily absorbed dose of mercury which exceeds the excretory capacity via the urine and stool. It has now been well established and published by several authorities, including the World Health Organization, that amalgam tooth fillings are, by far, the major source of mercury exposure for the general population.(8) This was recently reiterated by Health Canada in its 1995 position paper on dental amalgam.(9) According to the World Health Organization's expert committee, the daily human exposure to mercury vapor from amalgam fillings ranges from 3micrograms to 17micrograms as compared to a maximum of 2.6micrograms from all other sources. It is disturbing to note that mercury was recently removed from latex paint in North America due to the health risks associated with inhalation of mercury vapor from the paint. Exposure to mercury from paint was estimated to be 4.6micrograms per day for approximately two weeks following application of the paint.(10) If mercury in latex paint was clearly considered such a health risk, why are amalgam fillings such a source of scornful dialog amongst the dental and medical community when amalgams are a much greater source and a far more persistent source of inhaled mercury?

Pharmacokinetics of inhaled mercury

Mercury vapor released from dental amalgams is efficiently absorbed through the alveoli. Following absorption through the lungs, elemental mercury vapor (Hg₀) is only found very transiently in the blood. Due to its high lipid solubility elemental mercury is rapidly transported through cell membranes (including cell membranes of the cells comprising the blood-brain barrier). Once inside metabolically active cells, elemental

mercury (Hg^0) is then oxidized by catalase to form ionic mercury (Hg^{2+}). Ionic mercury (Hg^{2+}) is not lipid soluble and it therefore results in a high degree of retention of absorbed mercury and a tissue half life ranging from days to decades depending on the particular organ.(11,8,12,13,14,15) This phenomenon clarifies why, studies have repeatedly demonstrated that after placement of amalgam fillings, blood and urinary mercury levels remain relatively low even though many organs develop concentrations of mercury many times greater than that of the blood.(16,17,18) Thus, blood or non-challenged urinary mercury levels bear little relationship to the total body burden of mercury gradually acquired from amalgam fillings.(19)

Biochemical effects of inhaled mercury

Once mercury enters the cell, it ultimately becomes bound covalently to the sulfhydryl groups found in glutathione, and to a lesser degree to cysteine, biotin, lipoic acid, coenzyme A as well as to other protein sulfhydryl groups. The major intracellular sulfhydryl compound in mammals is the tripeptide glutathione. Glutathione and the glutathione rich enzyme, glutathione peroxidase are probably the most important antioxidant defenses in most species including the human.(20) Mercury has been shown to cause a marked reduction in glutathione production and glutathione peroxidase activity and thus it may result in a marked rise in oxidative stress within the brain and other organs.(21,22,23) Apart from the loss of antioxidant protection from mercury induced inhibition of glutathione and glutathione peroxidase, mercury results in a marked increase in free radical generation through Fenton reactions and other mechanisms.(22)

In addition to its key role in antioxidant defenses, glutathione is also a critical component in the liver's detoxification mechanisms. Enzymes within the liver must form conjugates between glutathione and certain toxic metabolites, organic xenobiotics, and heavy metals to enable these toxins to be eliminated from the body. This process of glutathione conjugation makes toxic molecules more water soluble and enables their excretion via the bile or through the kidney. If liver glutathione production is markedly inhibited, as occurs when mercury accumulates within hepatocytes, mercury and numerous other toxic substances may more readily accumulate throughout the body because the excretion of such substances are significantly impaired.(24,25,26,22) Furthermore, because the majority of mercury is excreted through the stool and urine as a glutathione conjugate, individuals with long standing body burdens of mercury (and thus depleted glutathione production) may not demonstrate elevated levels of mercury in the urine, blood or stool when specimens are gathered in the absence of a challenge with an appropriate metal chelating agent. Thus, tissue biopsy of target organs or a provocation test measuring urinary mercury after the administration of a chelating agent, may be the only valid means to assess chronic mercury body burden.(27,28,29,30)

Uptake and distribution of inhaled mercury

Numerous studies have been performed demonstrating the body tissue uptake and distribution of mercury from dental amalgams. Studies using whole body imaging in primates with dental amalgams have clearly demonstrated that the amalgams result in high levels of mercury in the kidney, intestinal tract, brain, liver, and other organs. (31,16) Of great concern are human fetal and neonatal studies which demonstrate that mercury concentrations in kidney, liver, and brain correlate significantly with maternal amalgam surfaces.(32) Furthermore, a recently published study has firmly established the presence of mercury from dental amalgam in the milk of nursing mothers.(33)

Clinical effects of inhaled mercury

The impact of chronic, low level mercury exposure is now known to adversely impact numerous other cellular and organ system processes.(19) Ionic mercury is antigenic and may contribute significantly to autoimmune processes.(34,35) Mercury is also immunotoxic and it may result in immune suppression and allergy.(36,37,38,39) Recent research has also demonstrated that multiple strains of antibiotic resistant bacteria develop rapidly in the gut and oral cavity of both humans as well as non-human primates following the placement of amalgam fillings.(40)

Amalgam fillings have been shown to contribute to mercury accumulation in human and animal kidneys and this has been associated with a significant decrease in renal function.(41,42) Human fertility has also been shown to be significantly impacted by low level exposure to mercury vapor. A recent study examining 7000 dental assistants demonstrated that this group experiences a fertility rate approximately 40% less than that of women who have no occupational exposure to mercury.(43)

Of perhaps greatest concern is the potential role of low level, chronic mercury exposure upon central nervous system function. It is now well established, that amalgam derived mercury accumulates in monkey and human brain tissues.(41,31,13) Mercury has been shown to concentrate selectively in human brain regions involved with memory function and it may play a significant role in the etiology of Alzheimer's disease.(44,45) Other reports have shown subclinical motor and neuropsychological deficits amongst dentists and dental workers as compared to control subjects.(46,47) Mounting evidence has lead some to suggest that, in fact, mercury from amalgams may play a highly significant role in the etiology of numerous mental illnesses and neuropsychological disorders.(48, 49,50,51,52,53)

Pharmacology of DMPS (Dimaval; 2,3-dimercapto-1-propane sulfonate, Na⁺)

DMPS (sodium salt of 2,3-dimercapto-1-propane sulfonic acid) is not a new drug. It was developed in the former Soviet Union in 1958. In 1978, DMPS became available to the western world following its synthesis and production by the German pharmaceutical company, Heyl.⁵⁴ DMPS is a chelating agent in the group of dithiols, along with dimercaprol (BAL, British anti-Lewisite) and succimer (DMSA, 2,3-dimercaptosuccinic acid).

DMPS has been used extensively in Europe and on a limited basis in North America as a treatment for mercury (55), arsenic (56) or lead intoxication (57). It is a registered drug in Germany and, in fact, due to its long record of safety, is now available without prescription.⁽²⁸⁾ When compared with D-penicillamine and N-acetyl-DL-penicillamine, DMPS was the most effective agent to clear mercury from the blood of victims of the Iraqi mercury disaster in the 1960's. (58)

In addition to its safety and utility as an agent for detoxification, DMPS has been used frequently as an agent to approximate mercury body burden.^(56,59) As described above, resting urine or blood levels of mercury bear little relationship to body burden of mercury in cases of long standing, low level intoxication, such as that which may occur from dental amalgams.⁽²⁷⁾,

There is a great wealth of scientific literature on the use of DMPS as both a diagnostic tool and a treatment agent in cases of acute and chronic heavy metal intoxication. Much of the European literature surrounding DMPS has been summarized in the English language in a thorough scientific monograph which is in its sixth edition.⁶⁰ This monograph forms the basis for the rational use of DMPS by clinicians throughout the world. This monograph also formed the basis for the FDA sanctioned, multicentered trial on the use of DMPS in the evaluation of mercury body burden and response to mercury detoxification therapy in polysymptomatic patients with dental amalgams. (As an aside, Dr. Cline was a participant in the official training program for researchers participating in this multicentered trial and he achieved a mark in the 90th percentile range on the examination required for participation).

In the DMPS monograph, there is extensive reference to the work being done by European clinicians in the treatment of the polysymptomatic patient suffering from demonstrable mercury body burden. DMPS is initially used to assess the body burden of mercury and other heavy metals through provocation testing. Several methodological variations of this test are described. Because of the high degree of patient compliance, and because this methodology is in keeping with the pharmacokinetics of DMPS, I have elected to use the provocation testing methodology advocated by the German toxicologist, M. Dauderer, M.D.^(61, 60) In this methodology, DMPS is given as a slow IV push. The patient then provides the first voided specimen after one to one and one half hours. The urine is then sent overnight to a toxicology laboratory. Mercury and other heavy metals are reported as micrograms metal per gram of urinary creatinine. The creatinine compensates for variations in urinary dilution. This has proven to be a

simple test to perform, with a high degree of patient compliance. The quantity of heavy metal returned has generally correlated well to the symptom severity of the patients I have seen. Furthermore, the changes in metal excretion with this provocation test have corresponded well to the changes in symptom severity of the patients which I have seen. The provocation test forms a rational approach to the use of DMPS. When high quantities of toxic metals are no longer found with provocation urine testing, the DMPS is of no further value and its use may be discontinued.

As mentioned previously, the pharmacology of DMPS has been extensively described.(54,28) Both oral and parenteral preparations of this agent are available. Pharmacokinetic data on both preparations are available.(62,63) The parenteral route of this agent allows for better control over the dosage in highly sensitive patients (the treatment can be interrupted if the patient experiences adverse effects). The parenteral route also avoids transport of metals from the gut to the liver through the portal circulation and may be better tolerated by the highly sensitive patient.

The metabolism of DMPS has also been studied thoroughly. DMPS is excreted largely through the urine. Before its excretion, DMPS is biotransformed largely to acyclic and cyclic disulfides. This mode of biotransformation may suggest one advantage of DMPS over the other dithiol chelator, DMSA (succimer). As opposed to DMPS, DMSA is biotransformed almost completely to a cysteine conjugate. Because of this, DMSA may lead to further depletion of cysteine and glutathione stores, which are often already low in metal toxic patients.(64,62,65,23) DMPS undergoes both renal and biliary excretion.(66) DMPS is distributed in both an intracellular and extracellular manner.(66,67,68) However, Unlike most other chelating agents, such as BAL and EDTA, DMPS does not cross the blood brain barrier and does not redistribute mercury to the brain(28).

The toxicity of DMPS is well known and, in this regard, it provides very distinct advantages to the officially approved dithiol chelator, Dimercaprol (BAL). Although BAL continues to be stockpiled by the military in preparation for chemical warfare attack with the arsenical nerve gas, lewisite, it is 300 times more toxic than DMPS, has no corresponding challenge test and it clearly causes redistribution of metals to the brain.(69) Animal studies on the acute and chronic toxicity of DMPS have been carried out and the results illustrate the safety of this agent and its wide therapeutic window.(60) Numerous human studies have failed to uncover any significant adverse impacts of DMPS upon human renal function, liver function, cardiovascular system, blood, immune system, G.I. tract or any other organs or systems. Minor or avoidable side effects such as local irritation at the site of parenteral infusion or hypotension with overly rapid infusion of the agent have been reported.(60)

Rationale For Using DMPS:

The scientific rationale for using DMPS in determining the body burden of and the removal of mercury and other heavy metals has been outlined above. The clinical rationale for using DMPS in people suffering from idiopathic polysymptomatic disorders such as fibromyalgia and chronic fatigue syndrome is as follows. Current scientific understanding of these disorders suggests that the etiologies are multifactorial and may have significant environmental components including accumulation of heavy metals in key target organs. Most patients coming to my clinic with these chronic disorders have already attended several practitioners and have tried all sorts of therapies, usually to no avail. These patients are well educated regarding the various possible underlying etiologies and want to explore the possibility that heavy metals may be an underlying factor. I have observed that in most individuals in which mercury and other heavy metals are present, that a major improvement in their health usually occurs when they undergo detoxification using DMPS. This is in keeping with the observations made by numerous clinicians in Europe and in the USA by the principle investigators in the multicenter phase III, FDA approved clinical trial mentioned earlier. Finally, I want to emphasize that DMPS is not being utilized as the sole treatment in individuals suffering from these disorders, but rather it is being utilized as a method to relieve the patient of significant physiological stresses by decreasing the body burden of heavy metals. Although further research is clearly required in this area, my clinical experience over the last year in using DMPS has convinced me that this valuable agent has a key role to play in the management of highly disabling and previously intractable cases of chronic fatigue syndrome and fibromyalgia. There are many patients in my practice who are now healthy productive citizens instead of hopeless invalids, thanks to the use of DMPS administered in a safe manner.

References

1. Bremner MDK. The Story of Dentistry, 3rd Ed. . Brooklyn: Dental Items of Interest Publ. Co.; 1954.
2. Ring ME. Dentistry: An Illustrated History. . New York: H.N. Abrams Inc.; 1985.
3. Dexter JE. A History of Dental and Oral Science in America. In: Science AAoD, ed. Philadelphia: S.S. White; 1876.
4. Reinhardt JW. Risk assessment of mercury exposure from dental amalgams. J. Pub. Hlth. Dent. 1988;48:172-7.
5. Berry TG, Nicholson J, Troendle K. Almost two centuries with amalgam: Where are we today? J. Am. Dent. Assn. 1994;125:392-9.
6. Vimy MJ, Lorscheider FL. Intr-oral air mercury released from dental amlgam. J. Dent. Res. 1985;64:1069-71.

7. Patterson JE, Weissberg B, Dennison PJ. Mercury in human breath from dental amalgam. Bull. Environ. Contam. Toxicol. 1985;34:459-68.
8. Friberg L. Inorganic Mercury. In: Organization WH, ed. Environmental Health Criteria 118. Geneva: WHO; 1991.
9. Richardson MG. Assessment of mercury exposure and risks from dental amalgam. . Ottawa: Medical Devices Bureau, Environmental Health Directorate, Health Canada; 1995.
10. Lorscheider FL. Mercury exposure from indoor latex paint. N Engl J Med. 1991;324:851-852.
11. Skare I, Engqvist A. Human exposure to mercury and silver released from dental amalgam restorations. Arch. Environ. Hlth. 1994;49:384-394.
12. Clarkson TW, Friberg L, Hursh JB, Nylander M. The prediction of intake of mercury vapor from amalgams. In: Clarkson TW, ed. Biological Monitoring of Toxic Metals. New York: Plenum Press; 1988:247-260.
13. Goering PL, Galloway DW, Clarkson TW, Lorscheider FL, Berlin M, Rowland AS. Toxicity assessment of mercury vapor from dental amalgams. Fundam. Appl. Toxicol. 1992;19:319-329.

Sources of Mercury

- Mercury containing preservative (Thimerosal) still used in vaccines
- large fish
- dental amalgam
- mercury vapour released during amalgam removal
- older bathroom paints
- greens treated on golf courses
- vapour from broken fluorescent bulbs
- old thermometers
- science department in schools
- one drop of mercury spilled & run through vacuum and vaporized
- coal fired power plants (China)

In Past:

- Mercurochrome (red) disinfectant
- skin bleach for age spots
- "sanitizer" for diapers
- mercury thermostat switch
- mercury filled thermometer
- teething gels with mercury causes "pink disease"

- contact lens solution with Thimerosal

Symptoms:

- Brain fog/ rashes/ immune disorders
- Neurological damage
- Congestive heart failure
- Enzyme blockade resulting in low Glutathione
- Depression
- Fatigue
- Indigestion, paralysis of stomach "Gastroparesis"
- Endocrine (hormone) disruption
- Poisoning of Mitochondria (power plants in cells)
- Poor sleep - interacts with Gaba receptor
- Inflammation, allergies
- Iron metabolism disrupted resulting in anemia
- Impaired conversion - of T4 to active T3 Thyroid hormone
- Autoimmune Thyroiditis (Hashimoto's)
- Miscarriage/ infertility
- Muscle pain/ dizziness/ memory impairment/ oral sores/ tremor/ moodswings/ irritability/ loss of logical reasoning/ numbness
- MS like symptoms, Cancer

Treatment:

- Adequate Selenium levels (natural antidote to Mercury)
- Intravenous DMPS at first, later oral DMSA

Tests:

*Blood test does not show body burden

- Challenge/Provocation Test with DMPS (IV Mercury Chelator) and measure Mercury excretion in urine
- Sometimes mercury will show in hair

OTHER INTRAVENOUS (IV) THERAPIES

As with any therapy, IV therapies have risks and side effects which may include but are not limited to discomfort at the injection site, thrombophlebitis, and rarely, destruction of a vein.

Alpha Lipoic Acid – Alpha lipoic acid (ALA) is a vitamin-like antioxidant, sometimes referred to as the “universal antioxidant,” because it is soluble in both fat and water.¹ ALA is capable of regenerating several other antioxidants back to their active states, including vitamin C, vitamin E, glutathione and Coenzyme Q10

Alpha lipoic acid has several potential benefits for people with diabetes. It enhances glucose uptake in type 2 (non-insulin-dependent) diabetes, inhibits glycosylation (the abnormal attachment of sugar to protein), and has been used to improve diabetic nerve damage and reduce pain associated with that nerve damage.⁶ Most studies have used intravenous alpha lipoic acid, but oral supplementation has nonetheless proved partially helpful in treating at least one form of diabetic neuropathy, using 800 mg per day.

Preliminary evidence indicates that 150 mg of alpha lipoic acid, taken daily for one month, improves visual function in people with glaucoma.

Alpha lipoic acid has been shown to inhibit the replication of the HIV virus in the test tube. However, it is not known whether supplementing with alpha lipoic acid would benefit HIV-infected people.⁹

Intravenous administration of alpha lipoic acid has significantly increased the survival rate of people who have eaten poisonous mushrooms. Such a treatment should be prescribed by a doctor and should not be attempted on one's own.

The body makes small amounts of alpha lipoic acid. There is only limited knowledge about the food sources of this nutrient. However, foods that contain mitochondria (a specialized component of cells), such as red meats, are believed to provide the most alpha lipoic acid. Supplements are also available.

References:

1. Kagan V, Khan S, Swanson C, et al. Antioxidant action of thioctic acid and dihydrolipoic acid. *Free Radic Biol Med* 1990;9S:15.
2. Lykkesfeldt J, Hagen TM, Vinarsky V, Ames BN. Age-associated decline in ascorbic acid concentration, recycling, and biosynthesis in rat hepatocytes—reversal with (R)-alpha-lipoic acid supplementation. *FASEB J* 1998;12:1183–9.
3. Scholich H, Murphy ME, Sies H. Antioxidant activity of dihydrolipoate against microsomal lipid peroxidation and its dependence on alpha-tocopherol. *Biochem Biophys Acta* 1989;1001:256–61.
4. Busse E, Zimmer G, Schorpohl B, et al. Influence of alpha-lipoic acid on intracellular glutathione in vitro and in vivo. *Arzneimittelforschung* 1992;42:829–31.
5. Kagan V, Serbinova E, Packer L. Antioxidant effects of ubiquinones in microsomes and mitochondria are mediated by tocopherol recycling. *Biochem Biophys Res Commun* 1990;169:851–7.
6. Packer L, Witt EH, Tritschler HJ. Alpha-lipoic acid as a biological antioxidant. *Free Radic Biol Med* 1995;19:227–50 [review].
7. Ziegler D, Ulrich H, Schatz H, et al. Effects of treatment with the antioxidant alpha-lipoic acid on cardiac autonomic neuropathy in NIDDM patients. *Diabetes Care* 1997;20:369–73.
8. Filina AA, Davydova NG, Endrikhovskii SN, et al. Lipoic acid as a means of metabolic therapy of open-angle glaucoma. *Vestn Oftalmol* 1995;111:6–8.
9. Baur A, Harrer T, Peukert M, et al. Alpha-lipoic acid is an effective inhibitor of human immuno-deficiency virus (HIV-1) replication. *Klin Wochenschr* 1991;69:722–4.
10. Nichols TW Jr. Alpha-lipoic acid: biological effects and clinical implications. *Altern Med Rev* 1997;2:177–83 [review].
11. Zempleni J, Trusty TA, Mock DM. Lipoic acid reduces the activities of biotin-dependent carboxylases in rat liver. *J Nutr* 1997;127:1776–81.

Glutathione – Largely through the work of Dr. David Perlmutter, we now have access to impressive clinical and laboratory data that demonstrate marked improvement in symptoms of Parkinson’s disease and Alzheimer’s disease with the use of this therapy.

The therapy involves a simple intravenous infusion of glutathione over an approximate 30-minute period. Most patients can expect to see immediate improvements in gait, balance, motor coordination and mood.

There is a video available through Dr. Perlmutter’s website www.Brainrecovery.com which illustrates patient gait, balance and motor coordination both before and directly after the

glutathione infusion. The dramatic effects noted in the video include footage of patients who were completely unable to turn 180 degrees prior to the glutathione infusion walking and turning with ease afterward. All patients showed marked quickening of gait and noticeably improved balance. One woman who had exhibited the typical mask-like facial expression of advanced PD could smile easily after her glutathione treatment.

How might glutathione work in the treatment of PD? Can oxidative stress play a role the genesis of PD? Glutathione is a potent anti-oxidant that is capable of penetrating the central nervous system (brain). According to Dr. Perlmutter's research on alterations in glutathione levels, there seems to be both a clinical and neuropathological difference in PD patients treated with IV glutathione versus control groups. He measured both glutathione levels and oxidized glutathione levels primarily in the substantia nigra (portion of the brain most affected in PD) in PD patients and in control groups. Glutathione levels were reduced approximately 40% and oxidized glutathione was increased approximately 29% in the patients with PD. As he points out, this altered glutathione/oxidized glutathione ratio in the substantia nigra suggests that oxidative stress may be a component in the pathogenesis of nigral cell death in PD. Furthermore, the degree of reduction in glutathione seems to parallel the severity of the PD. Initial studies were done on patients with early, untreated PD. Patients were given IV glutathione twice daily for one month. All of the nine patients in the study improved significantly after the therapy, noting a 42% decline in disability. After the therapy had concluded, therapeutic effects were sustained for two to four months suggesting that in untreated PD, glutathione has symptomatic efficacy.

In a separate study, glutathione levels were compared between early and advanced cases of PD. Serum glutathione levels were significantly lower in cases of advanced PD. Cell death in the substantia nigra is a classic feature of PD. This neuronal degeneration may be a function of oxidative stress and of mitochondrial damage. Dr. Perlmutter suggests that mitochondria are critical targets for the toxic injury induced by oxygen radicals. Although the relationship between glutathione depletion, mitochondrial dysfunction and neuronal cell death needs further exploration, seemingly the clinical improvements in PD patients who are treated with IV glutathione in addition to their traditional medications warrants consideration in appropriate PD patients.

DMSO (a.k.a. dimethylsulfoxide) - It may be that water is the solvent used by life on earth simply because it is here in much greater quantities than any other solvent. A "solvent" is a carrier solution meaning that it has the capacity to accommodate other atoms and molecules in such a way that they are in "solution." What it means to be in solution is that the solvent separates the atoms and molecules from each other. When atoms and molecules are thus separated, they are said to be "carried" by the solvent, or "in solution." For example, water is an excellent solvent for salt. If you put a teaspoon of table salt in a glass of water and stir, soon you are unable to see the salt. It has gone into solution, i.e., the atoms of sodium and chloride are separated from each other and held apart by dihydrous oxygen (water).

Industrial chemists are always interested in finding new and more effective solvents. The perfect solvent, in an industrial sense, is that solvent, which has the ability to put almost anything into solution in high concentration, is cheap, safe and smells good. Dimethyl sulfoxide (DMSO), except for the smell, is just such a solvent.

Dimethyl sulfoxide (DMSO) was first synthesized in 1866 by the Russian scientist Alexander Saytzeff. Dr. Saytzeff reported his findings in a German chemistry journal in 1867. From there DMSO languished unnoticed in obscurity for 81 years! After World War II, chemists began to

take note of the remarkable versatility of DMSO. They noticed it could dissolve almost anything and carry it in solution.

In the 1960s, medical research with DMSO showed it could not only dissolve substances, but also it could also penetrate human skin and carry the dissolved substances along with it! This is remarkable, because human skin is impenetrable to most substances.

How does DMSO work? For one thing it neutralizes hydroxyl radicals and it turns out hydroxyl free radicals are the predominant cause of pain and inflammation in arthritis. Although DMSO is not known to cure cancer, it is true hydroxyl free radicals are present in cancer and in atherosclerosis. Hydroxyl radicals also are known to be produced in lipid peroxidation, which is thought to be the source of many degenerative diseases.

It also turns out DMSO is more "liquid" than water, and it can therefore penetrate to places in the body nothing else can reach so fast. DMSO substitutes for water and moves rapidly through cell membranes. It has been called "water's alter ego." This ability probably is what makes DMSO so unique as to be an entirely new therapeutic principle.

DMSO changes the water structure within the cell. Water exists in two basic structures, one more highly organized and one less organized. It may be that DMSO shifts the equilibrium between these two states of water toward the more organized form and thus speeds up the living processes of the cell, allowing healing to happen in a much accelerated fashion.

It was also shown to relieve pain and swelling, relax muscles, relieve arthritis, improve blood supply and slow the growth of bacteria. It relieves the pain of sprains and even of broken bones. It enhances the effectiveness of other pharmacological agents. If you apply DMSO to a bruise, the bruise dissolves and disappears in a matter of minutes! The pain of acute gout can be handled with the application of 5 cc of seventy percent DMSO in water four times each day. Application to a fever blister results in rapid resolution of this problem. DMSO speeds all healing, approximately doubling or tripling all healing responses.

Doctors experienced with DMSO treat the symptoms of cancer, atherosclerosis, Parkinson's disease, multiple sclerosis and arthritis with an intravenous push of up to 20 cc of a 25% solution of DMSO. An alternative method is to put 50-100 cc in 500 cc of saline and drip it in over a two- to three-hour period intravenously, with or without EDTA.

DMSO, although not approved by the FDA for anything except an unusual bladder condition (interstitial cystitis), is widely used in sports medicine. Professional sports in particular use DMSO to get their athletes recovered from injury and back on the playing field. Each team knows the competition will use it, and this would mean a tremendous advantage for the other team, if it were to be ignored. Combine that with the fact that DMSO is as safe as it is effective (unlike large-dose steroid injections, which were once commonly used in professional sports) and its use becomes mandatory in professional sports medicine. Only medical grade - never industrial grade - should be used on the human body due to the acetone and acid contaminants present in the industrial grade product.

The problem with DMSO is that it is so versatile and is such good treatment for so many conditions; it has fallen into the snake oil trap. It is too good to be believed. To be fully accepted, a therapy must have the general support of doctors and pure "scientific" research is lacking. However, there are a multitude of case reports on the benefits of DMSO treatments. People

who benefit from these therapies are those who take the time to educate themselves and who think for themselves.

Besides the great relief provided for sufferers of osteoarthritis, rheumatoid arthritis, burns, sprains, back and neck problems, there are more exotic uses for DMSO. Studies demonstrate that it protects against the tissue damage induced by radioactivity. It serves as an excellent antifreeze, preventing tissue damage ordinarily caused by freezing conditions. It controls the swelling of the brain and spinal cord following traumatic injury. If given intravenously within ninety minutes of a stroke, it prevents much of what would become permanent damage to the central nervous system. It has an antibacterial, antiviral and antifungal effect.

Some cancer researchers believe it has a useful place in the treatment of many cancers in that it potentiates other forms of therapy. It decreases the need for insulin in 25% of juvenile onset diabetics. Other uses of DMSO include: tic doloureux, headache, various skin diseases including herpes, cataracts and glaucoma, retinal degeneration, scleroderma, shingles, bunions, calluses, fungus toenails and asthma. These comments only scratch the surface of the possible medical uses of DMSO.

Vitamin C - High dose therapy in conjunction with a careful balance of other vitamins, minerals and supplements have shown to be beneficial in improving countless conditions by enhancing the anabolic processes of the body. Tissue integrity increases, organ function improves and the immune system is enhanced. Treatments are given 1 to 3 times per week and the patient must have a laboratory workup before, during and after a series of treatments.

Intravenous Vitamin C and Cancer - Vitamin C (also known as – ‘ascorbic acid’) is considered the most studied and yet the most controversial vitamin in history. It has been subjected to numerous research studies throughout the years. There are documented claims that vitamin C provides benefit for heart disease, schizophrenia, diabetes, autoimmune disease, helping fight infections, cancer, and more. In fact there are virtually no areas in medicine where vitamin C has not been used or studied at one point in time. The highest amounts of vitamin C in the body are found in the adrenal glands, brain, liver, spleen, pancreas and kidney for unknown reasons. White blood cells (which help fight infections) have 10-30 times higher amounts of vitamin C than the blood! One area in medicine where vitamin C thrives in controversy is in the field of cancer. Nobel Prize winner Dr. Linus Pauling and oncologist Dr. Cameron popularized the use of vitamin C in cancer during the 1970s.

Why Intravenous Vitamin C Is beneficial For Cancer Patients:

- Correction of any possible vitamin C deficiency (i.e. fatigue, bleeding)
- Enhanced immune system function (interferon, IL-2, others)
- Support white blood cells (have 10-30X higher levels than blood!)
- Stimulation of collagen formation (wall off tumors)
- Inhibition of hyaluronidase (prevents tumor spread)
- Enhanced wound healing after surgery

- Possible enhancement of Erythropoietin (EPO)
- Pain relief, Anti-inflammatory
- Anti-stress & anti-depressant properties

IN GENERAL— EXTREMELY SUPPORTIVE OF THE ENTIRE BODY!

Some Basic Facts About Vitamin C

Circulating white blood cells have between 10-30 times higher levels of vitamin C than the blood

It is difficult to attain high blood levels of vitamin C orally due to a high kidney clearance Vitamin C is readily & easily used with in the body (its easy to deplete) Vitamin C blood levels (greater than 3 mg/dl) better correlate to increased overall survival time in cancer patients High blood levels of Vitamin C (between 200-400 mg/dl) can kill tumor cells, however, this is only possible through injection in humans.

Vitamin C appears to kill cancer cells by increasing intra- cellular hydrogen peroxide, which is aided by the low levels of the enzyme catalase found in cancer cells

Initial intravenous vitamin C therapy is given 3-5x/ week for 4 weeks. The duration, dose, and frequency of treatments are catered to each individual case, the severity of the cancer, the type of cancer, and according to laboratory test results. To first time patients, 10 grams (or 10,000 mg) of vitamin C is administered in over a 1 hour time period to determine tolerance to treatment. The vitamin C doses are then increased in increments of 10 grams or greater per treatment. The maximum vitamin C dose can safely surpass 50 grams of vitamin C given over a 1-2 hour period. Doses over 100 grams (100,000 mg) have been well tolerated in selected and aggressive cancer cases.

Other important nutrients are also added to the intravenous protocol to help enhance vitamin C effectiveness and to further support the body. Oral vitamin C should be continued indefinitely while undergoing treatment. Intravenous boosters are recommended at the first suspicion of a negative change (i.e. metastasis, infection).

Intravenous vitamin C has a high safety margin and low risk profile. There may be a rare risk of a drastic massive tumor-killing phenomenon in cancer patients, which in turn may put a person at risk for severe shock. This is why low doses of vitamin C are given to patients in the initial stages of treatment. There may be a rare chance of "stressing" the renal system in patients with existing renal failure or in patients with severe kidney diseases. This is why, at the office, we perform a thorough laboratory analysis to help determine and minimize any potential risk(s) To date, no adverse reactions have occurred at the office.

Other useful websites:

▶ <http://www.wholehealthmd.com/news/viewarticle/1,1513,1170,00.html> - Glutathione use in Parkinson's disease

▶ <http://www.cancercontrolsociety.com/Berkson.htm> - Dr. Burt Berkson's, leading expert on alpha lipoic acid site

► <http://www.hepu.org/articles/Frmset.html> - Text of Dr. Berkson's article on alpha lipoic acid with particular reference to it's use in hepatitis and liver toxicities

ORTHOMOLECULAR MEDICINE

Orthomolecular medicine describes the practice of preventing and treating disease by providing the body with optimal amounts of substances which are natural to the body. The term "orthomolecular" was first used by Linus Pauling in a paper he wrote in the journal *Science* in 1968. This paper first described the theoretical foundations for what was later to become a specialty within complementary medicine. Many people use the term "nutritional therapy" synonymously with orthomolecular medicine, although the latter covers a much broader range of healthcare issues.

The key idea in orthomolecular medicine is that genetic factors are central not only to the physical characteristics of individuals, but also to their biochemical milieu. Biochemical pathways of the body have significant genetic variability in terms of transcriptional potential and individual enzyme concentrations, receptor-ligand affinities and protein transporter efficiency. Diseases such as atherosclerosis, cancer, schizophrenia or depression are associated with specific biochemical abnormalities, which are either causal or aggravating factors of the illness. In the orthomolecular view, it is possible that the provision of vitamins, amino acids, trace elements or fatty acids in amounts sufficient to correct biochemical abnormalities will be therapeutic in preventing or treating such diseases.

For the better part of the 20th Century, we've been taking vitamin and mineral supplements to eliminate deficiencies. Orthomolecular medicine takes this idea one step further, holding that larger than usual doses of certain nutrients can actually prevent or cure disease. Although there's still considerable debate over specific dosages and their therapeutic effects, the basic principle is now firmly established and widely accepted. Two of America's greatest scourges--heart disease and high blood

pressure--can sometimes both be held at bay by high-dose nutrients, and advocates insist that many other chronic conditions, including diabetes and schizophrenia, can be helped as well.

With certain vitamins, it's possible to boost your intake to therapeutic levels simply by altering your diet. For instance, you can easily get 400 micrograms of heart-healthy folic acid by increasing your consumption of green leafy vegetables and fresh fruits.

However, the only way to get medicinal doses of many other nutrients is to take supplements. This is true of vitamin E. For most people, it's also true of vitamin B₆, even though it's plentiful in whole-grain cereals and breads, beans, and nuts. Likewise, therapeutic levels of calcium are hard to achieve without taking a supplement.

Heart Disease - Mainstream medical experts have long held that reducing the amount of animal fat in the diet can reduce your risk of heart disease. Now they are beginning to recognize that large doses of vitamin E have a similar protective effect. While the Recommended Dietary Allowance for the vitamin is only 30 international units (IU) daily, several large surveys have linked higher doses of vitamin E--at least 200 IU--with lower rates of cardiovascular disease. Even better, the Cambridge Heart Antioxidant Study (CHAOS for short) discovered that 400 to 800 IU of vitamin E slashed the number of non-fatal heart attacks among heart disease patients by 50 percent in the first year of treatment.

Another nutrient with strong links to heart health is folic acid, a member of the vitamin B family. Scientists first began to suspect its impact when they noticed high levels of homocysteine in children suffering from a severe form of hardening of the arteries that's usually found only in older adults. Homocysteine is suspected of damaging blood vessel walls, and further investigation revealed that the kids lacked adequate amounts of an enzyme needed to clear it from the blood. As it turns out, this enzyme requires folic acid to do its job.

Additional research found that many adults also have higher than normal levels of homocysteine in the blood, and that they too are at greater risk of heart disease. The investigators found that a daily dose of between 0.5 and 5 milligrams of folic acid could bring homocysteine levels under control. But would this alone protect them from heart disease?

The question remained unanswered until Dr. Eric Rimm and his associates at Harvard University conducted a study of over 80,000 nurses. Rimm discovered that, as the women increased their intake of folic acid and vitamin B₆ (another vitamin involved in homocysteine metabolism), their risk of heart attack declined. The risk was lowest in women who were getting more than 400 micrograms of folic acid and more than 3 milligrams of vitamin B₆ in their daily diet (more than twice the Recommended Dietary Allowances). The evidence was so compelling that, in an April, 1998 editorial, the prestigious New England Journal of Medicine concluded that all Americans should take 400 micrograms of folic acid a day.

The bottom line: To maximize your chances of escaping heart disease, many experts now recommend that you not only follow a low-fat diet, but also supplement it with 400 IU of vitamin E, 3 milligrams of vitamin B₆, and 400 micrograms of folic acid per day.

High Blood Pressure - There is accumulating evidence that an increase in your mineral intake can be an effective remedy for mild hypertension. Clinical studies have found that, for people with a deficiency, extra calcium can lower high systolic blood pressure readings by as much as 13 points, and reduce diastolic readings to some extent as well. (Systolic blood pressure is the force against the artery walls during each beat of the heart. Diastolic readings give the pressure while the heart is at rest.) Calcium supplements have proven especially effective for people who are salt-sensitive--that is, those whose blood pressure goes up when they eat too much salt.

Similarly, a recent study entitled Dietary Approaches to Stop Hypertension (DASH) linked deficiencies in calcium, magnesium, and potassium with higher blood pressure readings, and found that merely boosting intake to recommended levels is sufficient to lower systolic and diastolic readings by 11.4 and 5.5 points respectively in people with high blood pressure. This modest increase in mineral intake produces the same results as a standard high blood pressure medication. Recommended Daily Allowances of the minerals are 1,000 milligrams of calcium, 400 milligrams of magnesium, and 3,500 milligrams of potassium.

When taking calcium supplements, it's important to boost your intake of vitamin D as well, since without enough of this vitamin, the calcium you take won't be absorbed into the bloodstream. For example, when older women take calcium supplements to forestall the brittle-bone disease osteoporosis, they are usually advised to take as much as 800 IUs of vitamin D daily--twice the standard recommendation.

Shizophrenia - This calamitous and still unexplained mental disorder sparked the first experiments with high-dose nutrient therapy. Indeed, when Linus Pauling, PhD coined the word "orthomolecular," he was referring to the schizophrenia treatments pioneered by Abram Hoffer, MD. Believing that large doses of niacin, vitamin C, and other nutrients might relieve the disease, Hoffer conducted controlled trials in which neither the patients nor the doctors knew who was getting real vitamins and who was taking fakes. Although patients with established cases of the disease were unaffected, those in its early stages showed dramatic improvement.

Although subsequent trials by other researchers failed to confirm Hoffer's results, his proponents charge that the later trials either were poorly planned or failed to include early-stage patients. At this point, the majority of mainstream physicians still regard the treatments as unproven, even though many patients swear by them.

Diabetes - Years ago, when doctors first learned how to feed seriously ill patients intravenously, the early IV formulas did not include trace amounts of chromium, an essential nutrient. Many of these patients mysteriously developed a diabetes-like disorder which, as it turned out, was a direct result of a chromium deficiency. Since

then, researchers have found that daily intake of 200 micrograms of chromium picolinate can provide significant relief from diabetes, reducing the patient's need for insulin and oral diabetes drugs. A Chinese study found that between 200 and 1,000 micrograms a day improved blood sugar levels, serum cholesterol, and total metabolic control of the disease.

Although conclusive proof is still lacking, chromium picolinate may have other benefits as well. It has been prescribed for obesity, insomnia, depression, acne, and fatigue, and some advocates say it can even promote longevity.

High Cholesterol - A form of the B-complex vitamin niacin has long been an accepted remedy for high cholesterol levels. Dubbed nicotinic acid, and prescribed under the brand names Nicolar and Nicobid, it's taken in doses of 250 to 500 milligrams per day.

Almost everyone can increase their vitamin/mineral intake to therapeutic levels without fear of harmful consequences. However, if you are taking the blood thinning drug warfarin (Coumadin), you should avoid vitamin E supplements unless your doctor approves. Some reports suggest that the vitamin may cause bleeding under such circumstances. Another precaution: Vitamin E may interact with iron, so it's probably best not to take them at the same time of day.

Side effects are infrequent with orthomolecular treatments, but can occur. It is important to be evaluated and treated at a center, like CEIM, which is experienced in this type of therapy. Side effects are as follows:

Vitamin E - Even large doses of vitamin E are relatively safe, and most adults can handle up to 1,000 IU with little or no harmful effects. There have been a few scattered reports of fatigue and weakness among persons taking 800 IU a day, but the symptoms cleared up as soon as the supplements were stopped.

Folic Acid - While 400 micrograms of folic acid is considered safe for most people, larger doses can pose a problem for the elderly, who frequently suffer from a deficiency of vitamin B₁₂. Folic acid can hide the signs of this deficiency which, left unchecked, can progress to irreversible nerve damage. To eliminate the danger, simply take B₁₂ supplements along with the folic acid.

Folic acid can also pose a problem for people taking an anti-seizure medication such as Dilantin or phenobarbital. Each of these drugs causes a folic acid deficiency that needs to be remedied. However, a return to normal folic acid levels will increase the amount of drug needed to prevent seizures. To side-step this problem, doctors now prescribe the drugs and folic acid together.

Niacin - The high doses of niacin used in the treatment of schizophrenia (usually several grams a day) pose a slight risk of liver damage. It's best to take them under the supervision of a physician who will have regular liver function tests performed. If you

have diabetes, you also face the possibility of an increase in blood sugar levels when taking niacin.

Unlike regular niacin, the nicotinic acid form has a variety of potential side effects, including darkening of the skin or urine, diarrhea, dry skin, eye disorders, flushing, gout, headache, indigestion, irregular heartbeat, itching, low blood pressure, low urine output, muscle pain, tingling, ulcers, vomiting, warts, and yellow skin and eyes.

Chromium - Doses of as much as 1,000 micrograms a day (5 times the maximum recommended allowance) have failed to produce side effects in major clinical trials. Nevertheless, there have been a few isolated reports that suggest some very minor degree of risk. Among the reported reactions were "disturbed thinking" and mental slowness. One woman taking 600 micrograms a day suffered chronic kidney failure. Another developed kidney and liver problems after taking 1,200 to 2,400 micrograms a day for 5 months.

Also, if you have diabetes, don't forget that chromium supplements can decrease the need for insulin or oral medication, and could lead to an unhealthy drop in blood sugar levels unless your medication dosage is reduced. All the more reason to check with your doctor when you begin taking chromium.

It's wise to continue seeing your regular doctor while undergoing orthomolecular therapy, especially if you are also receiving conventional treatments. A number of prescription drugs interact with vitamins and minerals, and the higher the doses, the more likely an interaction will be. To guard against problems, make sure the orthomolecular practitioner knows about your prescriptions, and that your doctor knows about the supplements you're taking.

Other helpful websites:

- ▶ <http://www.orthomed.org/wund.htm> - General discussion and examples of common illnesses successfully treated on an orthomolecular basis
- ▶ <http://www.orthomed.org/kunin.htm> - Excellent overview of the philosophy and principles of orthomolecular medicine
- ▶ [Linus Pauling Institute Micronutrient Information Center](#) – Wonderful reference for detailed information regarding vitamins, minerals and phytonutrients