The Core Problem of Medicine

The core problem of medicine today is that we have raised generations of physicians who believe treatment of disease without drugs or scalpels is quackery. We are paying a prohibitive price for what I call N^2 D^2 medicine (Name the Disease X Name the Drug Medicine). There are effective non-pharmacologic and non-surgical methods for reversal of degenerative and immune disorders (acute diseases, with rare exceptions, are not sudden departures from health). These are protocols of nutritional medicine, environmental medicine, medicine of self-regulation and medicine of fitness. This is a different (and much less expensive) medicine.

The universe of the electrons and the cells within our skin is just as fascinating as the universe outside it. The marvels of biology within us are much more relevant to our health and life span than the miracles of technology outside. Patients need us physicians to help them look inward for disease reversal much more than they need the output of our prescription pads. This is the central issue facing us in medicine today.

(Taken from the monograph *The Altered Bowel Ecology States and Health Preservation)*

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Two Principles of Molecular Medicine

First,

We never test or treat only a *part* of a patient. In molecular medicine, one does not just test and treat a bit of the bowel for colitis, a slice of the stomach for gastric ulcer, a shred of the synovium for arthritis, or a clip of the coronary artery for the problems of the heart. To do so would be in a fundamental conflict with the precepts of molecular medicine.

Second,

We never withhold from any patient any of the supportive management protocols of nutritional medicine and environmental medicine, and the methods for self-regulation and fitness.

(Taken from *The Cortical Monkey and Healing*)

TABLE OF CONTENTS

Preface
Molecular Consideratins in Intravenous Nutrient Protocols 5
Redox Dysregulation 9
Molecular Thinking 11
Moving Beyond Cellular Pathology 15
Molecular Defense Pathways 17
Molecular Duality of Oxygen 23
Nutrient Gradient 27
Intravenous Protocols LIST 28
Goals and Indications 29
Vein Access 31
Osmolality 32
Adverse Effects 35
Bolus Therapy 38
Composition of Protocols 40
Magnesium and Membrane Damage 40
- PRIMER I 47
- PRIMER II 48
- PRIMER III 48
- Basic Protocol 49
- Acute Infections 51
- ABE States, Acute 55
- ABE States, Chronic 57
- Asthma 59
- Chelation 61
- Cyto-Protective 64
- Detoxification 66
- Fatigue 70
- Mineral Replacement 71
- Oxidative Mol. Stress (OMS) 73
- Pain Syndromes 75
- Pre- and Post Operative 77

Efficacy of Protocols 81
Intravenous Nutrient Bolus Therapies 87
Oxidant Protocols 89
Hydrogen Peroxide 90
Intramuscular Protocols 91
References 93

Preface

Science, Drugs and an Angry Colleague

Science is search for truth.

Science is measurement and reproducibility. Science demands precision and objective descriptions. Science calls for evidence that can be verified or refuted. Science begins with empirical observations. Science is self-correcting.

How does a physician go about searching for truth (and meeting the demands of science) in the practice of clinical medicine? Human biology is an ever changing kaleidoscope of molecular mosaics. Health and disease, at molecular and electron transfer levels, can be defined as the states created by the impact upon an individual's genetic make-up of the molecules in his external and internal environments. Health, in this light, can be seen as molecular dynamics which preserve the structural and functional integrity of cells, tissues and organs. Disease, by contrast, can be defined as molecular events which cause cellular and tissue injury. I consider the clinical practice of medicine based upon these precepts as "molecular medicine".

How does a physician go about meeting the high demands of science when he faces a sick person? How does he see and interpret the fast changing molecular kaleidoscopic images of disease? How does he see and interpret them in health so he can advocate rational scientifically valid measures for preserving health for the full life span of the individual?

In formulating my intravenous nutrient protocols, I have been guided by the following five considerations:

First,

these protocols must be safe as far as can be determined in light of the known knowledge of the structure and function of nutrient molecules, and the known aspects of holistic molecular relatedness in human biology.

Second,

these protocols should reflect the metabolic roles of nutrients in health and disease, and not represent attempts to correct putative nutrient deficiencies.

Third,

these protocols must be integrated with other *molecular* protocols of nutritional medicine, environmental medicine, medicine of self-regulation and medicine of fitness.

Fourth,

these protocols should represent, as far as possible, the value of nutrients empirically observed by my colleagues who have had extensive clinical experience with intravenous therapy.

Fifth,

these protocols should be evaluated carefully and thoroughly on an ongoing basis for their clinical efficacy for the various disorders for which these are used.

Recently, a colleague expressed his deep disappointment with my clinical work.

"Do you think it is ethical or moral for you to experiment with people?" he asked indignantly. "The efficacy of new therapies must be assessed with double-blind cross-over studies. You are making your own rules. You are combining so many nutrients in your protocols. Is this good science? This is a dangerous game you play." I smiled at him sheepishly and changed the subject.

This is my time to answer my angry colleague. All progress in medicine starts with some empirical observation. A therapy is proposed to be tested, and validated or refuted. Yes, there is risk in all new therapies.

First, a few brief comments about the *blessed* double-blind cross-over model for medical research. I ask my angry colleague to consider for a moment the history of medicine. Sanitation was a major advance in medicine. Was it double-blinded and crossed-over? Vaccination was a major advance. Was it double-blinded and crossed-over? Surgery was a major advance. Was it double-blinded and crossed-over? Anesthesia was a major advance. Was it double-blinded and crossed-over? X-ray was a major advance. Was it double-blinded and crossed-over? Penicillin was a major advance. Was it double-blinded and crossed-over? Immunology was a major advance. Was it double-blinded and crossed-over? Enzymology was a major advance. Was it double-blinded and crossed-over? Genetics was a major advance. Was it double-blinded and crossed-over? I ask my angry colleague what major advances in medicine were ever made with the double-blinded and crossed-over model of research? In worship of his God of the double-blind cross-over, I ask, does he ever reflect on such matters?

Now for the double-blind cross-over model of research for drug therapy. Do we really need to blind the patient and the physician when we treat acute disease in a very sick patient with a drug? What possible advantage can blinding an acutely sick person have? Do we really need to blind a chronically ill patient? Do we ever succeed in blinding the patient or the physician for months during our double-blind experiments? I assume both the physician and the patient have some intellect and some curiosity. I know for a fact that drug investigators learn about the identity of the drug and the placebo within days of commencing the double-blind research projects. Drugs exert their biochemical effects and these effects reveal their identity. Drugs change the results of the laboratory tests (which drug studies are always required to perform) and are so recognized. Researchers and patients have an intuitive sense of knowing the effects of drugs. Finally, people who suffer from chronic illnesses and are subjects of double-blind cross-over studies *never* do only what the drug researchers ask them to do. They suffer and think about their suffering. They try many other nutritional, environmental and self-regulatory methods, albeit without knowledge of their drug researchers. So when the study data show the efficacy of a drug, it is not the drug alone which helped the patient. (Astute physicians can tell when a treatment works and when it does not work. The point is they do not need to carry the facade of blinding). If this is all true, one might ask, why do the drug companies (and physicians on their payroll) persist with the facade of double-blind cross-over? The answer is simple. How else do they get FDA approval for their drugs?

There is an amusing side to this double-blind cross-over issue. The drug companies spend huge sums of money to preserve the scientific integrity of their data about a single drug. When that drug hits the market, my colleagues use it in conjunction with several other drugs, sometimes combining as many as six to twelve different drugs. So I ask my angry colleague how often has he done double-blind cross-over studies of his *concurrent* use of two drugs? Or of concurrent use of three drugs? Or of concurrent use of seven different drugs? Does he know if his drug companies have ever conducted double-blind cross-over studies of *concurrent* use of two or three or seven different drugs. Does he ever *concurrently* use drugs made by competing drug companies? Have his drug companies ever conducted double-blind cross-over studies of concurrent use of their own drugs *and* the drugs of their competitors? Does he think it is ethical or moral for him to treat any of his patients with concurrent use of drugs synthesized by competing companies? Is that good science? Isn't he making his own rules? Isn't he playing a dangerous game with his patients? I use nutrients concurrently because that is what *Nature* does. I take my lessons from Nature. When he uses several drugs concurrently, who does he get his lessons from? The sales reps of drug companies?

My angry colleague sees God's hand in FDA approval of each drug. I ask him how many of these drugs *proven* to be safe and effective by the double-blind cross-over methods and published in the most prestigious journals are subsequently *proven* to be unsafe and ineffective? He accepts (as an unassailable article of his *science*) every therapy deemed acceptable by the high priests of "peer-reviewed" medical literature. How often do his

patients tell him that they do not get better with these therapies? When this happens, does he persist forever and ever in using the same therapies or does he reflect on his failures and seek to improvise? Does he ever switch drugs (discontinue drugs *proven* to be effective by the drug researchers and *proven* to be ineffective by his patients)?

My angry colleague is a better physician than he allows. He does use his mind. Indeed, he is an empiricist just as I am an empiricist. He does practice empirical medicine. The only difference between us is that he is an empiricist in drug medicine based on morphologic diagnosis made *after* the tissues have been injured, while I am an empiricist in nutritional, environmental and self-regulation medicine based on a study of molecular dynamics *before* the tissues have been injured. His science is the science of the names of diseases and names of drugs. My science is a science of molecular dynamics in human biology and of nutrients. My science is no meaner than his science. I do not begrudge him his science. God bless my angry colleague in his pursuit of *all* answers to his clinical problems in drug chemistry.

The real issue in molecular medicine is this: *the double-blind cross-over method of drug research is utterly irrelevant to the clinical practice of this medicine.* Indeed, our ongoing insistence on this mode of research speaks poorly of our intellect and is a disservice to those who trust us with their health and lives.

So, how does a physician go about meeting the high demands of science when he faces a sick patient? He does so with the labor of learning and *knowing.* Knowledge of the molecules of physiology of fitness, of pharmacology of nutrients, of chemistry of the environment, of immunology of allergy and infectious agents, of pathology of autoimmunity, of glucose-insulin-lipase dynamics of exercise, and of biology of self-regulation ---- these are the requirements for meeting the high demands of science in the clinical practice of molecular medicine.

I write about the intravenous nutrient protocol included in this monograph with substantial personal experience. Further, I have drawn heavily on the clinical experience of many of my colleagues who have used intravenous therapies for their own patients. These protocols are completely safe when uncommon attention is paid to common details of intravenous therapy. These protocols are effective. I prepare this monograph in the sincere hope that these protocols will be tested by many physician colleagues, and will be validated, modified, or refuted in the best traditions of science.

Majid Ali, M.D. Denville, New Jersey, May 1, 1993

Molecular Considerations in Intravenous Nutrient Protocols

There is complete agreement among physicians about the clinical efficacy of intravenous nutrient protocols. Those who use these protocols are convinced of their enormous clinical value. Those who do not are equally convinced of their futility. It is easy to see why we in the first group are so enthusiastic about intravenous nutrient protocols. These protocols allow us to dramatically reduce the use of antibiotic and other types of drug therapies. They are extremely effective for resolving hard-to-define but unrelenting clinical symptoms such as fatigue, a sense of being "not healthy", stress and panic attacks, palpitations, mood and memory disorders, abdominal bloating, and symptoms of allergy and chemical sensitivity. Further, these protocols frequently allow us to successfully manage patients with chronic indolent degenerative and immune disorders who obtain little long-term clinical relief from the prevailing pharmacologic regimens. Finally, intravenous nutrient protocols in my experience are extremely valuable for some disorders for which there are no known effective drug regimens, i.e., incapacitating chronic fatigue.

It is not easy to see how the physicians who do not use intravenous nutrient protocols become convinced of their futility. How can anyone ever be really convinced of the value of any nutrient therapies which he has never used?

There are five essential molecular considerations in the formulation and administration of intravenous nutrient protocols described in this monograph.

First,

there is the issue of non-pharmacologic therapies based on an understanding of molecular dynamics in health and disease ("molecular medicine") vs drug therapies based on the established morphologic patterns of disease ("tissue injury medicine"). This issue of the use of non-drug protocols of molecular medicine vs the drug and surgical treatments is a critically important issue. The essential distinction here is this: the morphologic diagnosis established microscopic studies tell us about tissue injury *after* the tissue have been injured. The study of molecular dynamics of health and disease, by contrast, gives us insights into the workings of the cells and tissues *before* the injury has occurred. This indeed calls for a major intellectual adaptation. Like all other adaptation, it can be expected to create considerable

difficulties for the physicians with intellectual subservience to classical medicine. This in my view is also the true cause of spurious controversy about the efficacy of nutrient therapies.

Second,

there is the issue of growing oxidative stress on human biology (and chemical sensitivities triggered by it), its impact on health and causation of disease, and the use of nutrients for providing an essential counterbalance. I discuss this issue at length in my monograph *Molecular-Immunologic Basis of Environmental Health*[1] and in a recent article entitled "Hypothesis: Chronic Fatigue is a State of Accelerated Molecular Oxidative Injury[2]." Some brief comments about the essential biologic nature of the aging process, accelerated (premature) aging caused by the increasing oxidative stress on human biology, and the molecular basis of health and disease follow later in this monograph. Stress of modern life enormously increases oxidative stress on human tissues. In my books *The Cortical Monkey and Healing*[3], *The Butterfly and Life Span Nutrition*[4], and *The Ghoraa and Limbic Exercise*[5], I discuss this central issue at length and describe effective self-regulatory methods for stress control and self-regulation. I refer the professional reader to some previous publications for extensive discussions of the subjects of allergy diagnosis and management[6-12] Another important subject of wide ranging implications in the present discussion of molecular medicine is the subject of altered bowel ecology. I discuss this subject in my monograph *The Altered States of Bowel Ecology and Health Preservation*[13].

Third,

there is the issue of correcting putative nutrient "deficiencies" with nutrient therapies vs use of nutrients for their metabolic roles. This issue requires some comment. The dogma that essential nutrients should be used to correct nutritional deficiencies is the principal roadblock to clear thinking in molecular medicine. Indeed, molecular medicine cannot be practiced until this intellectual barrier is broken. For example, the use of ascorbic acid only to treat scurvy is utterly irrelevant to the clinical problems we see every day. In the discussion which follows, I use the example of ascorbic acid to make a case for looking at the clinical uses of nutrients with a larger perspective of redox dysregulation and causation of disease rather than narrow focused attempts to correct deficiency diseases such as scurvy (of which I have never seen a case, nor do I expect to see one in my life).

Fourth,

there is the issue of holistic molecular relatedness in human biology. No molecule exists in biology alone, functionally or structurally. This is self-evident. And yet we physicians insist in diagnosing "a nutrient deficiency" to understand "a disease" which we can then treat with "a nutrient therapy". The irony is that we continue to neglect clear established evidence against this simplistic notion. I cite here two specific examples. In our studies of transport and distribution of iron in the bone marrow and other compartments of the reticulothelial

system, we observed marrow-iron-depletion with microcytic anemia coexist with massive iron overload in the liver, spleen, adrenals, heart and other organs[14-17]. The obvious and firm conclusion drawn from these studies was that functional iron deficiency can exist even when other body tissues are overloaded with iron. In my studies of ascorbic acid, I observed clear normalizing effects of this vitamin on the structural integrity of eryhtrocytes cell membrane in patients with chronic fatigue and functional improvement in platlets plasma membrane following oxidative stress of adrenaline, collagen and other aggregating agents[18-19]. The results of these studies are consistent with a growing body of clinical and experimental data which support the concept of universality of protective effects of free radical scavengers such as ascorbic acid.

In classical medicine, we follow what I call the dogma of three Ds (one disease, one diagnosis, one drug). This is the legacy of Oslerian philosophy of using all available clinical data to arrive at the diagnosis of a single disease to be treated with a single therapeutic agent. Drugs, we know, work by inactivating, impairing or inhibiting one or more molecular pathways. Drugs are *designed* for this purpose. In acute life threatening disease, these molecular effects of drugs save life (though at a substantial cost of adverse effects). In chronic immune and degenerative, xenobiotic drugs carry a much higher potential for adverse effects because they are used for longer periods of time, often for years. This is where nutrient protocols formulated with full knowledge of structural and functional molecular relationships prevailing in health offer superior clinical benefits without any risk of adverse effects.

The essential issue here is this: Mono-nutrient therapy has no place in the clinical practice of molecular medicine.

I illustrate the essential concept of holistic molecular relatedness in human biology with the specific example of vitamin B_{12}. I have been a student of medicine for over 34 years. During this time I have heard "academicians" insult my colleagues in general practice and in internal medicine on innumerable occasions for using vitamin B_{12} on an empirical basis. What is it that this vitamin does? Why do I use it so liberally along with my intravenous nutrient protocols?

There are two major cobalamin-dependent enzyme systems in the body: methionine synthase and methylmalonyl CoA mutase. In the reactions facilitated by methionine synthase, methycobalamin participates in a methyltransferase reaction necessary for formation of folate; functional inadequacy at this step leads to impaired DNA synthesis. Impaired DNA synthesis interferes with cellular replication in rapidly proliferating tissues, and is expressed clinically in megaloblastic anemia, atrophic gastritis, glossitis, and hypospermia. Methylcobalamin is an essential cofactor in the conversion of homocysteine to methionine; methionine, in turn, is needed for formation of choline and choline-containing phospholipids, and for methylation of myelin basic protein. Functional inadequacy of the second enzyme system leads to accumulation of methylmalonyl CoA which competes with Acetyl CoA in the

pathways of fatty acid synthesis and causes formation of non-physiologic odd-numbered fatty acids. These "funny fatty acids" appear to be related to structural and functional abnormalities of myelin sheath which are associated with a plethora of clinical symptoms which respond well to cobalamin therapy in clinical practice.

Cobalamin is necessary for the functional integrity of the Krebs's cycle for energy generation through its role in isomerization of methylmalonyl-CoA to succinyl-CoA which is an intermediate in this cycle and is oxidized to CO_2 and water. This is the molecular basis for using methylmalonic aciduria as a functional test for this vitamin. Of the two forms of methylmalonic aciduria, one responds to parenteral administration of physiologic doses of cobalamin while the other requires massive doses such as one *gram* per day. Cobalamin is essential for cell maturation (the basis of its use in pernicious anemia) and appears to be involved with the integrity of DNA molecules. In the classical subacute combined degeneration of the spinal cord caused by cobalamin deficiency, there is separation of myelin lamellae, formation of intramyelenic vacuoles, and reactive gliosis. Clinical symptoms include *weakness*, stiffness of muscles, vague hard-to-define symptoms, and paresthesia. In advanced stages, there is muscle spasticity and contracture and ataxic paraplegia. Our interest here is in symptoms of early cobalamin deficiency. In a recent and a remarkable study, this vitamin proved clinically effective in reversing many of the "psychiatric-neurologic" symptoms in patients without any megaloblastosis or other hematologic abnormalities[20].

What is the role of this vitamin in the preservation of the structural and functional integrity of the neural tissue? From my own clinical observations I know cobalamin is quite effective in the non-pharmacologic management of asthma. What is its mechanism of action here? There is no clear answer to these questions yet. Vitamin B_{12}, I indicated earlier, serves as a coenzyme in the methylmalonyl CoA mutase reaction, and it seems highly likely that impairment of this critical step results in impaired fatty acid synthesis. This appears to be the *molecular link* between the diverse roles of this vitamin in the dysfunction of the neural tissue and the plasma membrane events which initiate bronchospasm in asthma.

The metabolic roles of cobalamin would have been fascinating enough if the story would end here. But there is more. Through its role in methionine metabolism, cobalamin contributes importantly to the methionine-cysteine-taurine axis, one of the essential sulfhydryl antioxidant pathways of the body. Further, and quite distinct from these direct enzymatic roles, cobalamin is one of the important growth factors for normal microflora in the human gut (See my monograph *The Altered Bowel Ecology States and Health Preservation*). Through this role, cobalamin (along with other growth factors for the gut microflora) exerts wide ranging biologic effects on human biology. I quote here a sentence from that monograph for emphasis:

> ***The human molecular defense systems exist as plants rooted in the soil of the bowel contents.***

I end this brief discussion of the metabolic roles of cobalamin with the following quote:

> ***"Could it be that the many cobalamin injections given over the years for vague symptoms were in fact justified?"***
>
> N Eng J Med 318: 1752; 1988

Fifth,

there is the issue of molecular benefits of nutrients vs the molecular burdens of drug therapy (drug detoxification). This critical issue is rarely given any consideration. How do our molecular pathways deal with drugs? We talk about drug metabolism in abstract terms. We discuss hepatic breakdown of drugs and speak of renal clearance of drugs or their metabolites. This is where our discussions usually end. What is the true "molecular cost" of drugs? Molecule for molecule, drugs waste essential defense molecules of the body. Good examples of this phenomenon are loss of vitally needed molecules of glutathione, glycine and taurine. (The first two are used for conjugation of drugs and other xenobiotics while taurine is a powerful quencher of hypochlorite radicals and serves as an important scavenger of free radicals.) These are the life-span molecules (see discussion below) which provide the necessary molecular counterbalance to the Aging-Oxidant Molecules. From this molecular perspective, the essential difference between nutrient protocols and drug therapy becomes obvious. Drugs deplete Life-Span Molecules; nutrient protocols sustain them. Drugs add to the aging-oxidative burden of disease; nutrients drastically reduce such burdens. I reiterate here for emphasis. Drugs are essential for acute life threatening disease. Drugs are poor substitutes for nutrients for reversal of chronic molecular disorders.

REDOX DYSREGULATION, DISEASES AND ASCORBIC ACID

The efficacy of ascorbic acid, administered orally as well as intravenously, in the clinical management of a host of degenerative, immunologic and infectious disorders, has been recognized by clinicians on an empirical basis. Considerable biochemical evidence provides a "molecular basis" for such clinical uses of this vitamin. Ascorbic acid is one of the principal aqueous phase antioxidants in human plasma[21]. It improves the function of lymphocytes, polymorphonuclear leukocytes and macrophages[22-24] and it enhances the functional efficiency of several enzyme systems[25-28]. It prevents the formation of carcinogenic nitrosamines from nitrites. The following two recent studies add to the many important metabolic roles this vitamin plays in maintaining the structural and functional integrity of the plasma membrane.

Ascorbic acid reverses abnormal erythrocyte morphology in Chronic Fatigue Syndrome.

Ali, M. Am J Clin Pathol 94:515, 1990

Ascorbic acid prevents platelet aggregations by norepinephrine, collagen, ADP and ristocetin.

Ali, M. Am J Clin Pathol 95:281, 1991

In the first study, patients with IgE-mediated allergy and chronic fatigue were found to show abnormalities of the erythrocyte membrane in up to 50% of their cells. Following an intravenous infusion of 15 grams of ascorbic acid, the erythrocyte morphology was restored in more than half of the cells showing abnormalities. This study demonstrates the efficacy of ascorbic acid in restoring the structural integrity of the erythrocyte membrane, and by implication, the membranes of cells of other tissues. Ascorbic acid appears to restore the normal erythrocyte morphology by reducing the oxidant stress imposed upon it by allergic triggers and other factors.

In the second study, ascorbic acid was found to prevent platelet aggregation induced by epinephrine, ADP, collagen and ristocetin in a dose-related fashion. Further, ascorbic acid caused dissociation of formed platelet aggregation. The data in this study suggest that ascorbic acid may be of value in the prevention of thrombotic disorders and arteriosclerosis.

Knowledge of the basic redox dynamics and free radical pathology is essential for understanding both the aging process and the initiation and progression of the disease process. The redox reaction determines the species life span. It determines the rates of the species metabolism and tissue auto-oxidation. It forms the molecular and electron transfer basis of the health, dis-ease; disease continuum. Degenerative diseases represent accelerated molecular "burn-out", a form of premature molecular and tissue aging.

From a teleologic perspective, the species life span may be regarded as a function of the specific nature of the redox homeostasis for that species, the essential counterbalance between the oxidative metabolic stress on tissues and the antioxidative potential of tissues, i.e., the tissue capacity for antioxidant generation. This viewpoint is supported by considerable experimental evidence[29-34]. A large body of experimental and clinical data supports the role of oxidant stress and free radicals in the pathogenesis of many disorders including arteriosclerosis, arthritis, cancer and degenerative disorders.

Two additional comments seem relevant to this discussion. The tissue generation of

ascorbic acid in rats increases ten-fold after intraperitoneal injection of chloretone and methylcholantrene and five-fold after phenobarbitone[35]. Blood levels of ascorbic acid in some patients with IgE-mediated allergy and chemical sensitivity taking 5 grams of ascorbic acid daily are often lower than those of healthy subjects taking no supplemental ascorbic acid (personal unpublished data). These observations suggest that tissues in the rat synthesize ascorbic acid to counter the additional oxidant stress imposed upon them by drugs and other agents. In humans who cannot synthesize ascorbic acid, supplemental ascorbic acid appears to be used in the same way. The two ascorbic studies concerning its effects on erythrocytes and platelets suggest a role for this potent free radical scavenger in the preservation of the structural and functional integrity of the plasma membranes of the various formed elements of blood.

Molecular injury and molecular repair, at fundamental levels, are energy events. Cellular injury observed and described in morphologic terms is a late event. Clinical disease, again at molecular and electron transfer levels, can be seen as redox dysregulation, albeit at a late stage.

MOLECULAR THINKING

"Molecular thinking" in degenerative, immunologic, infectious and environmental disorders is greatly facilitated by a concept of "aging-oxidant molecules" and "life span molecules".

Aging-oxidant molecules are a family of molecules which cause or facilitate the physiologic and pathophysiologic molecular changes in aging and injury caused by infectious and environmental agents. The life span molecules are a family of molecules which provide a counterbalance to the activity of aging oxidative molecules, and prevent molecular injury caused by aging oxidative molecules.

First Lines of Molecular Defenses: Molecular Duality of Oxygen

Molecular mechanisms involved in the oxidative disposition of environmental triggers are the first lines of molecular defenses against environmental injury.

Oxygen is life-giving. Oxygen is life-terminating. Oxygen is a molecular Dr. Jekyll and Mr. Hyde. Tissues and cells need oxygen to sustain them. This we understand well in our

study of the basic sciences. Tissues and cells are also "aged" by oxygen in the process of "living". Of this we have but little understanding in the clinical practice of medicine.

Oxidation is a spontaneous process; reduction requires expenditure of energy. What is the language of molecular injury? Oxidation. What is the language of molecular recovery? Reduction. What is the language of the aging process? Oxidative molecular injury.

Spontaneity of the oxidative process in human biology, in my view, is the essential nature of the aging process.

There are two major prevailing theories of aging. In the first, the free radical theory, highly reactive oxyradicals are believed to cause cellular aging. Free radicals, of course, are produced by the process of oxidation. In the second theory of aging, protein cross-linkage, various permutations of protein molecules caused by cross-linking, are regarded as the basic cause of aging. Again, protein cross-linking itself depends upon oxidative injury. Thus, both free radical generation and protein cross-linking, while clearly implicated in the biochemistry of aging, are secondary events. Spontaneity of oxidation is the basic phenomenon which initiates the process of aging. The biochemical and cellular processes involved in aging can take place in a slow, sustained and orderly fashion, preserving health for the length of the species life span. Or these processes can take place at an accelerated rate, causing disease and premature aging. This, in my view, is a matter of central importance in our understanding of health and disease states. The compelling clinical concept here is this: all our therapeutic strategies for degenerative and immune disorders, first and foremost, must be directed at reducing the need for increased oxidative molecular breakdown.

There is little conceptual difference between drug therapies and antioxidant therapies. Both types of therapies build dams downstream and strive to make water flow upstream. Rational therapies must first seek to downgrade the metabolic overdrive by reducing the need for oxidative molecular injury.

How can the need for oxidative molecular injury be reduced? By self-regulation, by reducing the total burden of environmental agents, by eliminating whenever possible the allergic triggers, and by minimizing the potential for microbial invasion. This is the true promise of preventive medicine. And this is where our prevailing model of drug treatment of diseases established with morphologic diagnosis fails, utterly and totally.

Accelerated oxidative molecular injury is the true initial "molecular lesion" in the pathogenesis of these disorders. This is the "front-end" of the disease.

Enzyme activation and inactivation, disturbances of cell membrane ligand dynamics, plasma membrane peroxidation and protein cross-linking are early membrane-associated molecular events. Toxin-gene-enzyme-immune (TGEI) phenomena, deficiency of essential minerals, heavy metal toxicity and autoimmune injury are intermediate molecular events. Structural subcellular, cellular and tissue injury are late events in the pathogenesis of disease[1]. These are the various facets of the "tail-end" of the disease.

ASCORBIC ACID: AN IMPORTANT LIFE SPAN MOLECULE

Ascorbic acid is a premium life span molecule. Several characteristics of this molecule qualify it for this distinction.

Ascorbic acid is one of the principal aqueous phase antioxidants in human plasma. It is an important reducing substance. It is a low molecular weight, water-soluble and readily metabolized molecule. It is capable of playing both sides of the "redox field"; in its oxidized form it can function as an oxidant in times of need.

Ascorbic acid is not simply an antiscorbutic agent. It should be rightfully considered as the first line of defense molecule against oxidative metabolic stress imposed upon human tissues by internal and external agents. The following guidelines for ascorbic acid dosage, in health and disease, are based upon several "molecular considerations" as well as actual empirical clinical experience.

GUIDELINES FOR ASCORBIC ACID

Daily dose for health preservation	2-4	gm Oral
Immune and degenerative disorders	4-8	gm Oral
Acute exacerbation of the above	10-16	gm Oral
Immune and degenerative disorders	10-15	gm I.V.
Cyto-protective and Pre-Op	10-15	gm I.V.
Acute Viral Infections	15-30	gm I.V.

The above doses are given as general guidelines. Dose for a given patient must be chosen on an individual basis. Larger doses to "bowel tolerance" may be prescribed for a variety of acute disorders associated with heightened oxidant stress on plasma membranes. Ascorbic acid may also be used in much larger doses for what I call "C-Catharsis" — the use of ascorbic acid as an effective cathartic agent in the management of the altered states of bowel ecology.

The concept of holistic molecular relatedness in human biology is central to the practice of nutritional medicine. *Mono-nutrient therapy has no place in the clinical practice of molecular medicine. The use of ascorbic acid in nutritional medicine must be integrated with other nutrients according to the specific needs of individual patients.*

Molecular Medicine:
Moving Beyond Cellular Pathology

Health and disease, at molecular and electron transfer levels, can be defined as the states created by the impact upon an individual's genetic makeup of the molecules in his external and internal environment. Health, in this light, can be seen as molecular dynamics which preserve the structural and functional integrity of cells, tissues and organs. Disease, by contrast, can be defined as molecular events which cause cellular and tissue injury. I consider the clinical practice of medicine based upon these precepts as "molecular medicine".

Molecular Medicine:
An Intellectual Adaptation

The prevailing standards of medicine are based upon concepts of diseases defined with microscopic study of the injured tissues. Of necessity, this involves the study of cells and tissues *after* they have been injured. I repeat here for emphasis what I wrote earlier: that the study of molecular dynamics, by contrast, gives us insights into the nature of molecular and electro-magnetic events which initiate cellular and tissue injury *before* such injury has occurred. This is the essential difference between the orthodox medicine and the molecular medicine.

Rudolph Virchow, the father of pathology, published his classical book *Cellular Pathology* in 1858. He liberated us from the restrictive tenets of the gross pathology of medieval and ancient times. Now "molecular pathology" must free us from the restrictive tenets of cellular pathology in areas where cellular changes do not tell us how the disease *begins.*

Molecular medicine is the clinical application of the principles of environmental medicine, nutritional medicine, medicine of self-regulation and medicine of fitness.

Molecular medicine is a misunderstood medicine. There are two principle reasons for this:

* Molecular lesions, in their early phases, often do not fit into the templates of established morphologic patterns of cellular injury.
* Patient's suffering caused by molecular lesions, and as described by the patient, often cannot be understood and explained with established patterns of biochemical

evidence of tissue injury.

Molecular Lesions

A clear understanding of molecular lesions is beginning to evolve from an explosion of new knowledge in diverse fields of scientific inquiry. Until recently, induction of severe and persistent symptomatology caused by *theoretical* molecular lesions could not be explained on the basis of known knowledge of the morphologic patterns of disease. This is beginning to change.

A clear understanding of molecular and energy basis of clinical syndromes caused by molecular lesions calls for a full familiarity with several established aspects of genetics, molecular defense pathways, molecular responses to environmental agents, enzyme activation and enzyme inactivation, aberrations of the immune system and the essential molecular relatedness in human biology.

Work in Human Genome Project, and genetic mapping included in this project, will undoubtedly unravel the molecular mysteries of "molecular diseases". This can be expected to resolve many of the "controversies" which surround the fields of environmental medicine, nutritional medicine, medicine of self-regulation and medicine of fitness. But recognizing how genes are mutated (and mutilated) by xenobiotics and cause disease is one thing, preventing and treating these disorders quite another. Many physicians appear to take a position that they will diagnose and treat what I call molecular lesions when the existence of these lesions is "proven" and when research has led to the development of drugs designed to correct the molecular disruptions seen in these disorders. Such is the currency of simplistic notions in the prevailing dogma of medical beliefs. It does not speak well of us physicians. It severely punishes our patients.

Non-linearity in Molecular Defenses: Chaos in Biology.

To fully understand the scientific underpinnings of molecular and energy events which initiate and perpetuate environmental illness, we need to integrate established aspects of human biology with the newer knowledge of the relatedness in the molecular dynamics in the internal and external environments of man. It appears to be a simple matter of time that many apparent inconsistencies between clinical observations and established knowledge of biology will be resolved with newer statistic model of meta-analysis and Chaos equations. There is mounting evidence that even very simple biological systems obey non-linear equations of the Chaos physics.

"Especially in the physical sciences, the ubiquity of chaotic fluctuations is well-established. Fundamentally, chaos results from the action of non-linear laws of motion. Because even very simple biological systems obey non-linear equations, it should come as no surprise that there is mounting evidence for chaos in biology."

Science 249:499; 1990

Molecular Puzzles

There have been important recent advances in our understanding of the molecular relatedness in the areas of genetics, receptor-ligand chemistry and energy events, enzyme-xenobiotic dynamics and free radical pathology. This includes accretion of insoluble molecular products of physiological and pathophysiological aging processes and molecular and immunologic consequences of injury by environmental agents. In areas where such molecular relatedness is not readily recognized with the prevailing scientific precepts, the applications of Chaos equations to models of human disease are allowing us to put these "molecular puzzles" together.

Molecular Defense Pathways, Molecular Responses to Xenobiotics and Molecular Lesions

Molecular host defenses form the basis of the immunologic and non-immunologic cellular and tissue responses to environmental agents in the pathogenesis of clinical syndromes. Following are some brief comments about molecular host defenses.

First Line of Molecular Defenses: Molecular Duality of Oxygen

Molecular mechanisms involved in the oxidative disposition of environmental triggers are the first line of molecular defenses against environmental injury.

Second Line of Molecular Defenses: Enzymatic Metabolic Detox Pathways

Metabolic pathways involving such detoxification mechanisms as sulf-oxidation, carbon-oxidation, phosphorylation, conjugation and glucuronidation are the second line of molecular defenses against environmental triggers.

I cite here one example. Cysteine oxygenase catalyzes the first step in the oxidation of cysteine to inorganic sulfate. This enzyme plays a role in the formation of sulfoxides from S-carboxy-L-methylcysteine, and this reaction varies widely among individuals[36]. Impaired sulfer oxidation has been documented in many autoimmune disorders including primary biliary cirrhosis[37], rhuematoid arthritis[38,39], and systemic lupus erythematosis[40]. These observations are clinically significant, since inadequate supply of inorganic sulfate limits the rate of formation of non-toxic sulfates (conjugates of compounds such as steroids, drugs and environmental ppollutants which can then be readily excreted).

However, these mechanisms are often unable to cope with insoluble organic compounds with long half-life. For instance, the half-lives of dioxin and chlordane have been estimated to be over 6 and 15 years respectively. Evidently these second lines of molecular defenses are, for practical purposes, totally ineffective against dioxins, chlordane and other families of related molecules.

Third Line of Molecular Defenses: The TGEI Dynamics

Gene-xenobiotic-enzyme-immune dynamics are the third line of molecular defenses against environmental injury. Evidence is rapidly accumulating that the pathogenetic mechanisms of environmental disorders involve complex inter-relationships between environmental toxins, genes, enzymatic inductions, and structural and functional impairments of immune cells. Genes provide the hitherto missing links between the toxin exposure and persistent clinical symptomatology. Toxins can directly bend or otherwise so disfigure the DNA molecules that they become vulnerable to deletion or transcription by a host of proteins. In health, DNA is usually packed tightly within the nucleus and hard to get to. When bent or disfigured, DNA becomes more accessible to proteins in its vicinity. When the DNA so injured happens to encode specific enzyme systems, enzyme activation so caused may persist for long periods of time and eventually lead to clinical disorders. These molecular relationships, and the long-term chemical consequences initiated by them, can be illustrated with the example of dioxin which follows this section.

Fourth Line of Molecular Defenses: The Classical Immunologic Mechanisms

The classical immunologic mechanisms of Gell and Coombs, and others not clearly delineated in this classification, represent a fourth set of line of molecular defenses in the present discussion of molecular defenses against biologic hazards imposed by molecular and energy events which occur in our internal and external environment. The essential point in this context is this: *immunologic concepts of disease represent considerations of the tail end of disease*. If we are seriously interested in preventive medicine, we must look at the front end of disease, i.e., molecular and energy events which separate the state of health from the state of disease.

Molecular Responses to Xenobiotic Challenge
Initial Electron Transfer Events

* Redox Stresses
* Free Radical Stresses
  (Internal milieu and external environment)
* Metabolic Acidotic Stresses
* Clinical symptoms vague, hard to define and attributable to multiple organ-systems
* Physical examination generally does not yield specific information
* Laboratory abnormalities confined to subtle chronic metabolic acidosis

The primary molecular defenses against oxidant-inflicted tissue damage are mediated by superoxide dismutase, catalase and glutathione peroxidase intracellularly, by plasma proteins and ascorbate extracellularly, and by lipid soluble antioxidants tocopherol and carotene predominantly in the hydrophobic cell membrane compartment. An inverse relationship between plasma levels of certain dietary antioxidants and incidence of cancer has been documented[41]. There is some indirect evidence showing inadequate protection of cells by normal levels of plasma antioxidants against DNA-damage caused by oxidant overload[42]. Increased redox stresses in play central roles in the pathogenesis of chonic immune, degenerative, allergic, and chemical sensitivity disorders.

The integrity of plasma membrane and mitochondrial oxidative enzyme systems is

for initial electron transfer events which preserve initial molecular defenses and cellular health. When these electron transfer defenses fail, the disease begins. Which tissue or organ turns out to be the seat of subcellular and cellular injury, is determined by the impact upon the genetic make-up of the organisms of the environmental factors (which organ is elected by the body organs to be their spokes-organ).

> ***"Results demonstrate the following: (1) Mitochondria isolated from ischemic myocardium have a low rate of ATP production, reduced ATP/O ratios and lower net ATP production. These functions are improved by EDTA. (2) Mitochondria from ischemic-reperfused myocardium are totally incapable of phosphorylating ADP in the absence of Ca-chelating agents. Addition of EDTA or EGTA either to the isolation medium or to the incubation medium restores the ability of these mitochondria to phosphorylate all added ADP, although the rate of this phosphorylation remained very slow. (3) The Ca^{++} content of mitochondria from ischemic reperfused myocardium was higher than the Ca (2+) levels of mitochondria from either normal or ischemic myocardium."***

J Mol Cellular Cardiol 9:897; 1977

This study provides us important insights into how seemingly innocuous changes in life-span metals such as calcium profoundly affect the electron transfer and energy events which are critical to the molecular health of the organisms. The mitochondrial enzyme injury caused by heavy metal toxicity is a much more serious and long-lasting threat to human health.

> ***"Surprisingly, the capacity of mitochondria, aged by either of the above aging procedures, to oxidize citrate was maintained or restored by the addition of 0.001 M EDTA***
> ***(ethylenediamine tetraacetic acid) to the system used only to measure citrate oxidation."***

Nature 187:162, 1960

The mechanisms by which EDTA exerts this effect are not fully understood. In addition to its ability to chelate metal ions, EDTA appears to restore the oxidative functions of mitochondria by forming a complex with mitochondrial membranes and promoting incorporation of dinitropyridine nucleotide into mitochondrial enzymes systems[3]. These observations carry some important implications for environmentally sensitive individuals. Even though direct evidence that EDTA stabilizes mitochondrial membranes in chemical sensitivity has not yet been reported, it seems highly plausible that this indeed does occur. This may be one of the explanations of observed clinical benefits of EDTA chelation therapy for chemical sensitivity (unpublished personal data).

Molecular Responses to Xenobiotic Challenge
Early Plasma Membranes and Enzyme Responses

* Enzyme Induction (Activation) Stresses
* Enzyme Inactivation Stresses
  (the "dys-regulated" reactions include acetylation, methylation, conjugation, glucuronidation, carbon-oxidation and sulfur-oxidation)
* Cell Membrane Receptor Stresses
* Oxidative Membrane Peroxidation Stresses
* Oxidative Protein Cross-Linking Stresses
* Oxidative Oligo- and Polysaccharide Stresses
* Clinical symptoms vague, hard to define and attributable to multiple organ-systems
* Physical examination generally does not yield specific information
* Laboratory abnormalities confined to early enzymatic changes as well as increased quantities of the products of lipid, protein and carbohydrate oxidation

Enzyme systems frequently activated by xenobiotics include cytochrome P-450 systems and enzymes frequently inactivated by xenobiotics include choline esterases, sulfite oxidases and phenol sulftransferases. In clinical practice, the enzyme responses to xenobiotics can be modified by several factors. I cite here two specific examples.

Alcohol is a potent inducer of cytochrome P-450 mixed function oxidase system. It potentiates the toxic effects of acetaminophen because of this effect, and possibly by reducing the body glutathione stores. Acetaminophen is normally metabolized by conjugation with glucuronic acid or sulfate, and the non-toxic conjugates are excreted by the kidney. However, a small proportion of acetaminophen is metabolized by cyctochrome P-450 system enzymes to form a highly toxic metabolite, N-acetyl-p-benzoquinoneimine. Normally, this metabolite is preferentially inactivated by conjugation with glutathione. However, glutathione may be rapidly depleted after large doses of acetaminophen. Insufficient glutathione supply then leads to hepatocellular damage inflicted by free N-acetyl-p-benzoquinoneimine. Fatal

acetaminophen toxicity in alcoholic liver injury has been reported (ASCP Drug Monitoring and Toxicology 8:1; 1987).

Cimetidine is an inhibitor of cytochrome P-450 mixed function oxidase enzymes. The biochemical consequences of this reaction remain masked in most patients taking cimetidine because of collateral enzymatic detoxification systems. Cimetidine inhibition of cytochrome P-450 system becomes unmasked, often with disasterous results, when these patients are exposed to potent insecticides and pesticides. Permanent neuorologic damage due to exposure to insecticide Diazinon has been reported in individuals taking cimetidine.

In clinical practice, evidence for enzyme activation or inactivation can be developed by the study of their byproducts and metabolites of xenobiotics. For example, increased urinary level of D-glucaric acid is generally an indication of hepatic enzyme activation by xenobiotics. D-glucaric acid is generated by breakdown of glucose as one of the consequences of enzyme activation by a host of organic chemicals. It is important to recognize that hepatic enzyme activation (and the raised levels of urinary D-glucaric acid which follow) are also seen after other forms of liver injury caused by chemical and biologic agents such as alcohol, drugs and hepatitis virus.

Certain metabolites such as mercapturic acid can serve as indicators of the detoxification process. Many chemicals which cannot be disposed off by the simple processes of oxidation, reduction or hydrolysis are "detoxified" by conjugation with molecules such as glutathione. The chemical-glutathione complex may be transformed into an acetyl-cysteinyl-chemical complex, and be designated as mercapturic acid. The rate of mercapturic acid formation, as determined by urinary clearance, can serve as an indicator of the detoxification rate.

The enzymatic efficiency of sulfite oxidases and enzyme systems involved with trans-sulfuration steps are of special importance to individuals with allergic disorders such as asthma, chemical sensitivity and chemical toxicity. These enzymatic functions can be assessed by measurements of urinary sulfites and sulfates.

Molecular Responses to Xenobiotics

Intermediate Molecular Responses

* Toxin-gene-enzyme-immune (TGEI) phenomena
* Essential Mineral Deficiency Stresses
* Toxic Mineral Stresses
* Immune Stresses
    - Early Autoimmune Stresses

- Late Gell and Coomb Type 1 through type 4 responses
* Clinical symptoms of established disease can be corroborated with immunologic analytic technologies.
* Physical signs indicative of altered organ or organ-system ecology
* Laboratory evidence of multiple organ involvement.

Molecular Responses to Xenobiotic challenge
Late Morphologic And Clinical Responses

* Subcellular changes
* Cellular structural changes
* Ecologic Changes in Tissue and Organ-systems
* Histopathologic Tissue and Organ Lesions
* Clinical symptoms characteristic of classical patterns of cellular and tissue injury
* Physical signs characteristic of classical patterns of cellular and tissue injury
* Laboratories abnormalities characteristic of established morphologic lesions easily definable with histologic examination

In classical medicine, our diagnosis is based on histopathologic criteria and demonstrable abnormalities of the immune system. The core point here is this: Classical medicine looks at the tail end of the disease. Molecular medicine looks at the front end of the disease because that is where the true potential of preventive medicine is.

MOLECULAR DUALITY OF OXYGEN: OXYGEN IS A MOLECULAR DR. JEKYLL AND MR. HYDE

Knowledge of the basic redox dynamics and free radical pathology is essential for understanding both the true nature of the aging process and the molecular lesions and the clinical syndromes caused by them. The redox reaction determines the species life span. It determines the rates of species metabolism and tissue auto-oxidation. It forms the molecular and electron transfer basis of health/dis-ease/disease continuum. Molecular lesions, at a fundamental level, are variants of an accelerated molecular "burn-out", a form of premature molecular and tissue aging.

Oxygen creates life and it ends life. Oxygen is a molecular Dr. Jekyll and a molecular Mr. Hyde. Cells and tissues need oxygen to survive. Cells and tissues are also broken down by oxygen. Oxidation is a spontaneous process; reduction requires expenditure of energy. What is the language of molecular injury? Oxidation. What is the language of molecular recovery? Reduction. What is the language of the aging process? Oxidative molecular injury. Spontaneity of the oxidation process is the essential nature of the aging process. Accelerated oxidative molecular injury is the "initial molecular lesion", the beginning of all disease processes. Which tissues or organs bear the brunt of such oxidative stress (serve as the weak link in the chain of biology) naturally depends upon the alignment of nitrogenous bases woven into their DNA molecules.

MOLECULAR DUALITY OF OXYGEN AND CARBOHYDRATES

The concept of metabolic oxidative breakdown of carbohydrates to meet the energy demands of living tissues is well understood. What is often not well understood (and ignored in clinical medicine) is the potential for molecular and tissue injury caused by autoxidation of glucose and other sugars. Free radicals produced by non-enzymatic glucose oxidation add to the substantial oxidative stress on patients with clinical environmental illness.

MOLECULAR DUALITY OF OXYGEN AND LIPIDS

It seems highly likely that cholesterol in the final analysis will be established as an innocent bystander molecule. LDL cholesterol in its native un-oxidized form is not a harmful molecule, except in rare patients with marked elevations of cholesterol levels on hereditary bases. Macrophages in vessel wall have receptors only for oxidized form of LDL. Recent studies have demonstrated the importance of this essential aspect of the role of lipids in health and disease.

> ***Oxidative modification of low density lipoprotein (LDL) enhances potential atherogenicity in several way, notably by enhancing its uptake into macrophages. This suggests that diets sufficiently enriched in oleic acid, in addition to their LDL-lowering effects, may slow the progression of atherosclerosis be generating LDL that is highly resistant to oxidative modification.***
>
> Pro Nat Acad Sci 87:3898, 1990

Lipids in plasma membranes are essential for membrane fluidity, membrane surface potentials, membrane surface ligand activity, and membrane transport functions. Environmentally sensitive patients are under accelerated oxidative and free radical stresses, hence the importance of the study of oxidative lipid injury in health and disease.

MOLECULAR DUALITY OF OXYGEN AND PROTEINS

Proteins are generally considered for their role in synthesis of structural components of tissues and hormones. The role of proteins and their peptides in the non-hormonal communication between molecules and cells is often not given due consideration. Oxidative injury to proteins de-natures proteins, causes cross-linkage, and most significantly impairs the molecular and cellular communication pathways. Environmentally sensitive individuals are at heightened risk for such injury.

The phenomenon of oxidative protein cross-linkage can be illustrated with the example of albumin. Albumin is rich in amino acid cysteine. Oxy-radicals rupture the chemical bonds between the sulfur atoms of cysteine. These bonds then reform but between distant sulfur atoms this time, thereby cross-linking the albumin molecules and locking them into a meshwork of abnormal (and functionally impaired) protein molecules.

MOLECULAR DUALITY OF OXYGEN AND MINERALS

*** Pro-oxidant Minerals**

- Iron
- Iodine
- Copper

*** Antioxidant Minerals**

- Zinc
- Selenium
- Magnesium

MOLECULAR DUALITY OF OXYGEN AND VITAMINS

Vitamins are the mainstay of anti-oxidative molecular host defenses in biologic systems. Biologic systems actively generate vitamins for detoxification purposes. In their studies of interactions between ascorbic acid and drugs in rat, Conney et al demonstrated that urinary excretion of ascorbate rises by five-folds when the animal are administered phenobarbitone. The urinary excretion of ascorbate increase ten-fold when rats are administered chloretone35.

In preventing oxidative injury to lipids, proteins, carbohydrates and minerals, vitamins are oxidized and de-natured. In environmental illness, the patient is often in double jeopardy: oxidative cytochrome P-450 and related enzyme pathways are often activated with resultant unrestrained oxidative injury; and detoxification enzymatic pathways such as phenol sulftransferases are often inactivated. The need for the anti-oxidative protective roles of vitamins rises steeply as oxidative stress increases. This is the principal reason why environmentally sensitive patients often require large oral and intravenous nutrient supplementation.

HEAVY METAL OVERLOAD AND TOXICITY

Heavy metal toxicity with lead, mercury, cadmium, aluminum, nickel and other metals plays pivotal role in the causation and perpetuation of various immunologic and environmentally-induced molecular lesions.

The government guidelines for Acceptable Daily Intake (ADI) for immunotoxicant heavy metals are totally irrelevant to patients with immune, environmental and degenerative disorders. The same holds for organic solvents and aromatic and aliphatic compounds.

> ***"It is concluded that the amounts of As, Br and toxic heavy metals in Dutch total-diet samples of male adolescents are of little concern as regards health aspects. The mean daily amounts of cadmium (21 ug), mercury (0.7 ug), lead (32 ug), arsenic (38 ug), bromine (8 mg), tin (0-65 mg).***
>
> British Journal of Nutrition 61:7; 1989.

Studies like the one quoted above make mockery of the true threat to the molecular and cellular integrity of patients with environmental illness imposed upon them by toxic heavy metals and organic compounds.

NUTRIENT GRADIENT

I indicated earlier that the intravenous nutrient protocols described here are not intended to correct any *nutrient deficiencies*. Rather, these protocols are used to create a high gradient of nutrients between the intra- and extra-cellular compartments to deliver "nutrient boluses" to meet the increased demands of tissues for these nutrients in various disease states (accelerated oxidative molecular injury). The critical issues here are *the flushing the tissues with a high gradient of various critical nutrients* and *the concurrent availability of nutrients in optimal proportions.*

Vitamins, minerals, and amino acids administered intravenously are very effective for short-term nutritional support in acute exacerbation of chronic disorders. These protocols are also very effective in clinical situations where serious damage to the immune system can be anticipated to occur with regularity: chemotherapy and radiotherapy for cancer and extensive surgery for various diseases.

Intravenous route of therapy, bypassing the bowel mucosal barrier, eliminates all problems of absorption. It allows expeditious delivery of these essential elements to all the tissues. Further, these protocols, when administered with optimal composition of the required ingredients for the specific purposes, provide the tissues ready access to the necessary elements, concurrently and in proportion.

Intravenous nutritional protocols must be chosen and administered according to the specific needs of the individual patient. Clinical benefits must be carefully assessed.

Sound working knowledge of the molecular dynamics of health, aging and disease is essential for the practitioner of nutritional medicine. Treatment of clinical disorders with nutrient protocols requires complete familiarity with the metabolic roles of vitamins, minerals, essential fatty acids and essential amino acids.

The Intravenous Nutrient Protocols described in this monographs are given as guidelines to be used in conjunction with oral nutritional protocols described in this volume. Further, I suggest that the physician reader consider integrating these protocols of nutritional medicine with protocols for environmental medicine and self-regulation in his clinical practice. The clinical benefits observed with these protocols and described in this monograph and in my books *The Cortical Monkey and Healing, The Butterfly and Life Span Nutrition, The Ghoraa and Limbic Exercise* and *The Canary and Chronic Fatigue* were obtained with an integrated clinical approach employing all these protocols on the basis of need for individual patients. In clinical nutritional pharmacology, as in clinical use of drugs, it is imperative that each patient be treated individually.

INTRAVENOUS NUTRIENT PROTOCOLS

Following is a list of the intravenous protocols which can be recommended for specific clinical indications. These protocols are safe and effective alternatives to drugs in many patients with specific clinical disorders.

* Primer I Protocol
* Primer II Protocol
* Primer III Protocol
* Acute Infections Protocol
* Acute Altered Bowel Ecology (ABE) Protocol
* Chronic Altered Bowel Ecology (ABE) Protocol
* Asthma Protocol
* Chelation Protocol
* Detox Protocol
  (Chelation Protocol alternating with Fatigue Protocol)
  Impaired Immunity (I & I) Protocol
* Pain Protocol
* Pre-operative and Post Operative Protocol

Again, the recommendations for intravenous protocols listed above should be regarded as guidelines. The need for individualizing treatment for each patient in nutritional medicine is absolute. In nutritional medicine, more so than in classical medicine, *molecular (metabolic) individuality* of the patient must be taken into account. Metabolic requirements of various nutrients vary widely in different individuals and in different clinical disorders.

The protocols for intravenous nutritional supplements are intended for specific metabolic functions, and not to serve any ill-defined goals of prevention of vitamin, mineral and amino acid deficiency states. This is a simple but a very significant point. Physicians who do not practice nutritional medicine sometimes fail to fully recognize the clinical implications of this aspect.

GOALS OF INTRAVENOUS NUTRIENT PROTOCOLS

The goals of intravenous nutritional therapy are in essence the same as goals for oral nutritional therapy. The main difference, obviously, is the time frame, immediacy of the desired nutritional support and the intended clinical results. Following are the principal goals for such therapy.

First, to bypass the bowel mucosal barrier, to circumvent absorptive dysfunctions, and to deliver the nutrients directly to the tissues.

Second, to deliver the necessary nutrients to the tissues in optimal proportions, concurrently and for maximal synergistic effects.

Third, to restore the functional integrity of enzymatic pathways in chronic disorders known to result in vitamin, minerals and amino acid deficiencies.

Fourth, to eliminate the need for drugs when feasible.

Fifth, to reduce the dose of needed drugs during the early period of caring for a patient.

Sixth, to protect tissue from injury caused by chemotherapy and radiotherapy.

Seventh, to expedite recovery from acute infections.

Eighth, to provide healing tissues extra supplies of nutrients before and after surgery (times of increased demands).

INDICATIONS OF INTRAVENOUS NUTRIENT PROTOCOLS

In my own clinical practice, I have observed good results with intravenous nutritional supplements for a host of clinical states. Similar clinical benefits have been obtained by many other physicians who are well-versed in the principles and practice of nutritional medicine.

Following are the main categories:

1. Acute viral infections where the commonly used antibiotics are of no significant value.

2. Acute and Chronic, Disabling Fatigue

3. Altered States of Bowel Ecology. These states includes a host of entities including, but not limited to, multiple food allergies, malabsorptive dysfunctions, recurrent episodes of Candida overgrowth or infection, C. difficile colitis, antibiotic-associated colitis, and bowel parasitic infestations such as Entamoeba, Giardia, Blastocystis, Endolimax and others. It also includes different variants of chronic bowel inflammatory disease such as ulcerative colitis and Crohn's colitis. I have discussed this subject in detail in my monograph *The Altered Bowel Ecology States and Health Preservation.*

4. Asthma and incapacitating bronchospasm associated with pulmonary emphysema.

5. Autoimmune and immunodeficiency syndromes.

6. Bacterial infections under treatment with appropriate antibiotics. The purpose here is to protect the tissues from drug toxicity.

7. Major surgery (before and after). The purpose here is to facilitate and expedite wound healing. It provides a counterbalance to the oxidative and other molecular stresses caused by the surgical procedures.

8. Chemotherapy (before and after therapy to protect the tissues from the cytotoxic effects of chemotherapy drugs).

9. Radiotherapy (before and after). The purpose here is also to protect tissues from cytotoxic effects of chemotherapy drugs and radiation injury.

10. Chemical sensitivity where functional enzymatic defects do not permit nutrients to be metabolized to their biologically active products. Some outstanding examples of such nutrients are minerals such as magnesium, zinc, and manganese.

11. Food and mold allergy coexisting with malabsorption, a circumstance generally associated with impaired absorption of oral nutrients.

12. Heavy metal toxicity and heavy metal overload without clinical evidence of enzymatic inactivation.

VEIN ACCESS

Care, caution and diligence are necessary for safe administration of intravenous nutritional protocols. The following are important considerations:

First,

Selection of a vein which permits free flow of the fluid so that the possibility of phlebothrombosis is kept to a minimum. Whenever possible, a large vein in the antecubital fossa should be selected. Veins on the dorsum of the hand in general carry a higher risk of discomfort and thrombosis.

Second,

All infusions should be given with winged butterfly needles. The optimal needle size for most people is #21. A smaller gauge of #23 may be necessary for some patients. Patients with large veins can tolerate #21 well, allowing the infusion to be completed in lesser time. It is advisable to start the IV with a 3 ml syringe attached to the butterfly to assure proper placement of the needle within the vein. During the infusion, if the patient complains of pain or burning, the placement of the needle should be checked again with a syringe to avoid the possibility of extravasation. The intravenous line should be carefully monitored to avoid extravasation of the solution into the tissues surrounding the vein. This often causes pain, discomfort and swelling.

Third,

Intravenous protocols should be started at a slow rate of 1-2 ml/minute for the first five minutes. The rate of infusion should then be increased to 2-5 ml/minute.

Fourth,

If pain, discomfort or burning occurs at the site of the venepuncture, and the proper placement of the needle within the vein has been assured, one of the following three measures may be undertaken:

1. Raise the arm or slow down the rate of infusion.
2. Add 1.25 to 2.5 mEq of sodium bicarbonate to reduce the acidity of the infusion solution.
3. Add 2 to 4 ml of 2% lidocaine (without epinephrine) to the infusion solution.
4. Apply warm packs.
5. Self-regulation methods (selective peripheral vasodilatation with Directed Pulses).

Pain more proximally in axilla usually indicates vasospasm. It can be generally managed by slowing the rate of infusion or by adding an additional 250-750 mg of magnesium chloride to the infusion fluid.

OSMOLALITY CONSIDERATIONS

Osmolality is a measure of the number of particles dissolved in a solute. The charge or size of the ion or molecule does not affect this measurement. The unit of osmolality is *mOsm.* One osmol of a substance is equal to the gram-molecular weight divided by the number of ions or particles into which the substance dissociates in solution. Thus one osmol of NaCl is 29 g (1 osmol = 0.5 mol or 58.5/2 = 29 osm since NaCl dissociates into two ions). One osmol of glucose is 180 g since the molecular mass of glucose is 180 and glucose does not dissociate. Osmolarity, a related expression, is a measure of non-electrolytes dissolved in a solute. Osmolality is a preferred measure because it is a constant weight/weight relationship. Osmolarity by contrast varies due to the volume-expanding effect of dissolved solute.

The normal plasma osmolality in health ranges from 285-310 mOsm/kg water. In general, for intravenous nutritional protocols described here, it is sufficient to maintain the osmolarity of the infusion fluid between 275 and 375 mOsm/liter. Such deviations from the normal range do not cause any osmolarity-related clinical problems when these infusions are administered at a slow rate. Five per cent dextrose and 0.45 per cent saline solutions are suitable as carrying fluids for most of the intravenous protocols described here. A brief review of the following table and composition of various protocols shows that protocols prepared with distilled water may tend to be hypoosmolar — a circumstance that is better avoided — and those prepared with 5 per cent dextrose or 0.45 per cent saline (or Ringer's lactate) solutions will be hyperosmolar — a situation that usually does not create significant clinical problems. For the slightly hyperosmolar solutions, the range of deviation from the normal plasma value is such that it poses no seroius threat to patients receiving 500 to 550 ml of such solution over a period of 2 1/2 to 3 hours.

The osmolality of the various components used in intravenous protocols are given below for

reference.

VITAMINS

B-1 Thiamine Hcl	100 mg/ml	0.65	mOsm/ml
B-5 Pantothenic acid	250 mg/ml	1.31	mOsm/ml
B-6 Pyridoxin HCl	100 mg/ml	1.11	mOsm/ml
B-12 Hydroxycobalamin	1000 ug/ml	0.38	mOsm/ml
B-Complex 100	100/ml	2.14	mOm/ml
C Ascorbic acid	500 mg/ml	5.80	mOsm/ml
C Sodium ascorbate	222 mg/ml	2.67	mOsm/ml
A Vitamin A	50,000 IU/ml	7.84	mOsm/ml

MINERALS

Calcium, gluconate	100 mg/ml	0.68	mOsm/ml
Chromium, chloride	20 ug/ml	0.0015	mOsm/ml
Copper, sulfate	2 mg/ml	0.0126	mOsm/ml
Magnesium, sulfate	250 mg/ml	2.03	mOsm/ml
Manganese, chloride	200 mg/ml	2.95	mOsm/ml
Molybdenum	25 ug/ml	0.80	mOsm/ml
Selenium	40 ug/ml	0.0005	mOsm/ml
Zinc, chloride	1 mg/ml	0.11	mOsm/ml

MISCELLANEOUS

Dextrose 5%	50 mg/ml	0.25	mOsm/ml
Normal Saline	0.9%	0.31	mOsm/ml
Half Normal Saline	0.45%	0.16	mOsm/ml
Sterile water	-	0.00	mOsm/ml
Ringer's lactate		0.28	mOsml/ml
Sodium Bicarbonate (44.6 mEq/50 ml)		1.79	mOsm/ml
Sodium Bicarbonate (50 mEq/50 ml)		2.00	mOsm/ml
Procaine Hydrochloride	20 mg/ml	0.28	mOsm/ml
Lidocaine	20 mg/ml	0.15	mOsm/ml
EDTA Edetate disodium	150 mg/ml	1.34	mOsm/ml
Heparin	5,000 IU/ml	0.46	mOsm/ml
Dimethylsulfoxide		0.01	mOsm/ml
Amino Acids	8.5%	0.810	mOsm/ml
Amino Acids	5.5%	0.58	mOsm/ml
Amino Acids	3.5%	0.45%	mOsm/ml

COMPUTING ESTIMATED OSMOLALITY

The estimated osmolality of an IV solution may be computed with the following simple steps:

First, multiply the volume in milliliters of each component with the mOsm/ml value given in the above table. This must include the volume of sterile water if any is used.

Second, add the values for the total volume used for each component as well as those for mOsm/ml.

Third, compute the estimated osmolality with the following formula:

Solution osmolality = total mOsm / total volume X 1,000

EXAMPLE I

Nutrient	Volume	mOsm
Vitamin C 10 gm	20.0 ml	116.0
Magnesium sulfate 50%	4.0 ml	16.0
Pantothenic Acid	1.0 ml	1.3
Heparin (5,000 U/ml)	0.6 ml	0.3
Sodium Bicarbonate 8.4%	2.5 ml	4.5
Dextrose 5 per cent	500.0 ml	125.0
Total	528.1 ml	263.1

Osmolality = 263/528 X 1000 = 498 mOsm
Osmolality of this formulation when dextrose is substituted with 0.45 per cent saline (80 mOsm)

= 218/528 X 1000 = 413 mOsm

Osmolality of this formulation when dextrose is substituted with sterile water (00.00 mOsm)

= 138/528 X 1000 = 261 mOsm

EXAMPLE II

Item	Volume in milliliters	mOsm/ml mOsm	Total
Sterile water	500	0.00	00.00
EDTA, disodium	20	1.34	26.80
Vitamin C	16	5.80	87.00
Magnesium chloride	10	2.95	29.50
Sodium bicarb 44 mEq	10	1.79	17.90
Heparin	1	0.46	00.46
Lidocaine	5	0.28	1.40
Pyridoxine	1	1.11	1.110
Thiamine	1	0.62	0.62
		-----	-----
Total	564 ml		164.79

Solution Osmolality = 164.79/564 X 1,000 = 292

RECOMMENDATIONS FOR OSMOLALITY ADJUSTMENTS

If the expected osmolality is less than 290 mOsm/L, it may be increased by reducing the quantity of the carrying solution or by adding some components. For instance, osmolality value of a 500 mL formulation may be increased from 220 mOsm//L to about 290 mOsm/L by adding 6 ml of vitamin C solution containing 500 mg/ml (or 12 ml of vitamin C solution containing 222 mg/ml).

If the expected osmolality is more than 320 mOm/L, it may be lowered by adding sterile water. As I indicate earlier in this section, hyperosmolar solutions administered slowly in a large vein generally do not pose any serious risks.

ADVERSE EFFECTS

Intravenous nutrient protocols as described here are safe and free of adverse reactions when

proper attention is paid to all the details of proper therapy.

Allergic reactions consisting of tachycardia, pallor, muscular spasms, erythema, urticaria and bronchospasm do occur but are extremely rare in my experience. In the few instances that I have observed tachycardia, pallor and muscle spasms, these reactions appear to have been more vaso-vagal in nature rather than true hypersensitivity reactions.

Hypoglycemic and hypocalcemic episodes are infrequent except in patients with derangements of carbohydrate and calcium metabolism. Such patients require careful observation and monitoring with appropriate laboratory tests just as it is necessary when administering other IV therapies for acute illnesses.

The risk of congestive failure developing as a result of slow administration of 500 ml or so of nutrient solutions to ambulatory individuals without pre-existing congestive heart failure is extremely small, if any.

Potential for renal damage and changes in anticoagulation status must be considered with EDTA chelation therapy.

Some simple steps can be undertaken to significantly reduce the incidence of these reactions. These include the following:

Practice of self-regulatory methods during intravenous infusions.

Taking the regular meal within an hour or so of receiving intravenous therapy. This is especially important for patients when a slow infusion is intended. This is critically important for edetate (EDTA) chelation therapy for reducing the body toxic heavy metal burdens.

Careful observation of the rate and site of infusion. Extravasation must be detected immediately and corrected promptly. Certainly the same level of skill and efficiency are required for office intravenous therapy as is necessary for a hospitalized patient.

DOING COMMON THINGS UNCOMMONLY WELL

I indicated earlier that intravenous nutrient protocols are completely safe when uncommon care is given to common procedural details. A patient reinforced this simple idea

some years ago. After receiving an intravenous therapy for an acute viral infection, she went to the ladies' room and fainted. After she recovered, I asked her what she had eaten for dinner that evening. She told me she had not eaten dinner that evening because she had not felt well. Next I asked her what her lunch that day had been. She had not eaten lunch either. On further inquiry she had not eaten breakfast either. Hypoglycemic and dehydrated, she was a good candidate for a fainting spell, whether or not she had been given any intravenous therapy. It is important to insist that the patient must have a light dinner before intravenous therapy is given. For EDTA chelation therapy, which often lasts for three or more hours, we also insist that patients take a healthy snack during the treatment. Attention to this simple detail can avoid many a problem with "tolerance" of intravenous therapies.

Another requirement for safe intravenous therapy is effective but simple methods for self-regulation. I have successfully administered intravenous therapy to many patients who thought they could not tolerate intravenous therapies because of unsuccessful past attempts. A single lesson in Limbic Breathing has usually provided enough training to these individuals so that they can significantly reduce their heightened adrenergic drive, reduce stress, breathe slowly, and receive their therapies uneventfully. (See my books *The Cortical Monkey and Healing* and *The Dog an Directed Pulses* for a description of simple but effective self-regulatory methods.) Selective peripheral vasodilatation achieved with the method of Directed Pulses is very valuable in bringing out a collapsed vein in patients with severe vasoconstriction due to stress or depression.

PHLEBOTHROMBOSIS AND PHLEBITIS

All patients requiring intravenous infusions face the risk of phlebothrombosis, whether the infusions carry drugs for hospitalised patients or nutrients in the clinical practice of nutrional medicine. It is imperative that this issue be discussed with patients prior to administering Intravenous Nutrient Protocols. (A sample consent form is included in the appendix.)

Who is likely to develop phlebothrombosis? It has been a very rare occurrence in my personal experience with chelation therapy for cardiovascular disease. This has not been the case for patients with severe chemical sensitivities and disabling chronic fatigue. Patients requiring chelation therapy almost always have easily accessible large veins; those with chronic fatigue sometimes do not. More important than the issue of large accessible veins — it seems to me — is the matter of the vulnerability of vascular endothelium to trauma associated with intravenous infusions containing large quantities of ascorbic acid and other nutrients. Indeed, spontaneous bruising and vasculitis unassociated with intravenous infusions is a common occurrence in chemical sensitivity and chronic fatigue. In the list of Intravenous

Nutrient Protocols given in this monograph, I include three Primer Protocols. I designed these protocols with the specific purpose of eliminating or reducing the potential for incompatibility reactions. I have not seen phlebothrombosis with Primer I protocol, and I believe the risk of such an event must be very small.

What are the true risks of phlebothrombosis — or phlebitis — that may result from intravenous nutrient therapy? I have not yet encountered a single case of embolism, symptomatic or otherwise, occuring as a complication of such phlebothrombosis. It must be conceded that this indeed may occur. As for the management of phlebothrombosis, standard therapies including warm packs and rest can be expected to be enough.

AN EXPLANATORY NOTE ABOUT ASCORBIC ACID

It is my practice to measure serum ferritin level for every patient requiring intravenous nutrient therapy. If the ferritin level is raised, I eliminate or reduce the amount of ascorbic acid added to the infusion to minimize the risk of oxyradical injury due to Fenton's reaction. It is also my practice to reduce the amount of ascorbic acid used in cases where access to large veins is limited and the patient experiences pain with intravenous infusion inspite of the use of rheologic agents included in the protocols.

INTRAVENOUS NUTRIENT BOLUS THERAPY

Many clinicians report good results with intravenous nutrient bolus therapy. In general, my own clear preference for intravenous therapy is with an intravenous drip. There are two main reasons for this. First, it is difficult to administer integrated vitamin and mineral formulations with simple intravenous injections due to the volumes of these solutions (often 50 to 75 ml). Second, slow intravenous drips of diluted solutions are generally much less likely to provoke adverse reactions than direct injections of highly concentrated solutions. Still, there are situations in which intravenous injections may be used expediently i.e. IV administration of magnesium and pyridoxin for acute musculo-skeletal pain syndromes (extreme care must be used when administering one gram of magnesium in a short period of several minutes in view of the potential for cardiac arrhythmias induced by a rapid increase in the blood level of magnesium). On rare occasions, IV injections indeed may be necessary because of poor status of peripheral veins (again, warming the hand or the arm with a heating pad or with a heater will usually make collapsed invisible veins quite visible

and suitable for access for intravenous infusion therapy.

ORAL NUTRIENT SUPPLEMENTATION

Intravenous nutrient protocols are not substitutes for long-term oral nutrient supplementation for health preservation and disease reversal. I describe over 40 nutrient and herbal protocols which I use in my clinical practice in *RDA: Rats, Drugs and Assumptions.* Optimal use of oral nutrient protocols to provide a counterbalance to the increasing oxidative stress of modern life, in my judgement, is the mainstay of the clinical practice of molecular medicine. Such supplementation should be regarded as an important part of a total approach to full health for the entire life span.

COMPOSITION OF PROTOCOLS

I reiterate here for emphasis what I wrote earlier in this monograph. I did not formulate the intravenous protocols described here to correct any putative "nutrient deficiencies". In composing these protocols, I have tried to address following major issues in molecular medicine:

1. Increasing oxidative stress on human biology under "normal" circumstances and in disease.
2. Plasma and cell membrane dynamics in health and disease.
3. Intracellular molecular events which follow oxidative stress on plasma membranes.
4. Holistic molecular relatedness in human biology.

I discuss fundamental aspects of increasing molecular oxidative stress on human biology earlier in this monograph. I discuss at length the plasma membrane dynamics in health and disease in my monograph *The Agony and Death of a Cell* published in the 1991 syllabus of the American Academy of Environmental Medicine. I briefly discuss the central importance of the concept of molecular relatedness citing the examples of cobalamin and ascorbic acid in this monograph.

It is not within the scope of this monograph to discuss the metabolic roles of each of the nutrients included in the protocols described here. Ascorbic acid, cobalamin, magnesium, pyridoxin, and pantothenic acid are among the major nutrients used in these protocols. I include some comments about magnesium here to illustrate essential metabolic roles of nutrients and furnish several important references in the bibliography[44-54]. Some brief comments about intracellular molecular events that result from oxidative stress on plasma membranes and influence the abnormal transport of magensium accross it follow.

MAGNESIUM: THE MIRACLE MOLECULE

I am very reverential to magnesium. I recognize such language may be regarded by some as unbecoming of serious medical writing.

Life began on our planet Earth with conversion of solar energy into chemical bond energy. Chemical bond energy is the thread which holds together the posies of life flowers. Chlorophyll converts solar energy into chemical bond energy and is a magnesium chelate.

ATPase and Acetyl CoA are premium molecules in human energy dynamics. Magnesium is a cofactor for both.

Magnesium plays important roles in the essential methionine-homocysteine-Cysteine-taurine and cysteine-glutathione sulfhydryl anti-oxidant defenses of the body.

The first step in glucose metabolism is conversion of glucose to glucose-6-phosphate. This reaction requires hexokinase, which is a magnesium-dependent enzyme.

Delta-6-desaturase is a critical enzyme in conversion of fatty acids of plant and animal origin into longer chain and unsaturated fatty acids which are essential for human metabolism. Delta-6-desaturase is a magnesium dependent enzyme.

Magnesium serves as a cofactor in diverse reactions involved in DNA and protein synthesis.

Increased intracellular levels of calcium poison cellular enzymes, hence the fascination of our drug industry with calcium channel blockers. Magnesium is Nature's calcium channel blocker.

Magnesium participates in many mechanisms that regulate the movement into and out of cells of other cations such as potassium, sodium and calcium.

Magnesium is a cofactor for a large number of enzymes such as kinases.

Acutely ill hospitalized patients almost always become magnesium-poor within a few days. Such deficiency almost always goes unrecognized because we continue to insist that a deficiency state must be documented with blood tests before embarking upon magnesium replacement therapy. The fact that only less than 1% of total body magnesium exists in the blood does not seem important to us (skeletal and intracellular compartments contain approximately 53% and 46% of magnesium, respectively). We fail to see the obvious: increased oxidant stress on cell membranes associated with illness which necessitates hospitalization leads to leakage of magnesium out of the cell and into the extracellular space and masks the intracellular magnesium deficiency. I discuss this essential issue further, later in this section.

The ideal test for functional magnesium deficiency in my judgement is a therapeutic trial.

The list of clinical syndromes which have been attributed to functional magnesium deficiency is very long and includes cardiac arrhythmias, coronary artery spasm, coronary insufficiency, sudden ischemic cardiac death syndrome, myocardial infarction, pre-eclampsia and eclampsia, hypertension, migraine, tetany, and hypokalemia and hypocalcemia.

A state of magnesium deficiency has been considered to exist based on magnesium retention tests in such diverse states as:

- pregnancy and lactation
- chronic fatigue associated with various viral syndromes such as EBV, CMV and Herpes.
- Food and mold allergy.
- Chemical sensitivity.
- Some patients with hypothyroidism.
- Some patients with diabetes.
- Respiratory muscle weakness.
- Osteoporosis.
- Migraine.

THE CELL MEMBRANE, OXIDANT STRESS AND CHANGES IN MAGNESIUM AND CALCIUM HOMEOSTASIS

The cell membrane is one continuous window for the cell to look at the world around it. It:

- Separates an internal order within the cell from an external disorder.
- Serves as the principle clearinghouse for physical and chemical information.
- Transforms information into physical change.
- Keeps under surveillance the intrinsic self-destruct mechanisms.
- Exerts control over growth, differentiation properties, and reproductive potential of the cell innards.
- Can *think* and alter its own ability to interact with its environment.

The cell membrane maintains critically important gradients between the intracellular and extracellular concentrations of cations via cation controlling channels. These channels are physical structures composed of specific protein molecules which change their molecular configurations to prevent or allow the passage of specific cations (a portion of the specific protein molecule lining the specific cation channel serves as a lid which can flip over to close the mouth of the channel or extend back to keep the channel open).

Next to potassium, magnesium is the most abundant intracellular cation. It is the fourth most abundant cation in the body. The plasma membranes expend considerable energy for maintaining a high transmembrane gradient for magnesium (and also for potassium). What do we expect when excessive oxidant stress on the cell membrane disrupts its functional integrity, and literally pokes holes in it? What is inside will hemorrhage out; what is outside will flood the cell innards! This is indeed what transpires. Magnesium and potassium along with some others escape from the cell into the extracellular space, and calcium along with some oothers enters into the cell in excess from the extracellular fluid. These molecular events, in my judgement, are among the changes most fundamental to the pathogenesis of degenerative and immune disorders. (I formulated my oral protocol TPM that contains taurine, potassium and magnesium, in a flash of insight, as I looked at and reflected on the suffering of a young woman paralyzed by chronic unremitting fatigue. Magnesium and potassium in this formula are intended to replenish intracellular reservoirs of these cations. Taurine promotes retention of these cations within the cell through its anti-oxidant role and many other metabolic actions that I discuss in *The Butterfly and Life Span Nutrition.*)

I relate three observations to elaborate my concepts of the cell membrane dynamics in health, incremental oxidant injury of the cell membrane and the fundamental changes in magnesium and calcium gradients across the cell membrane.

First,

our drug industry is ecstatic about their calcium channel blocking drugs. The reason for this is simple. Their researchers are rapidly adding to the long list of clinical entities where these drugs prove effective, albeit with considerable potential for side effects such as liver injury, dizziness, headache, hypotension, bradycardia, pulmonary edema, dyspnea, and fatigue.

Second,

the practitioners of nutritional medicine have long recognized the enormous value of oral magnesium supplementation in a large number of clinical entities. The only side effect that I know of oral magnesium supplementation is loose and frequent bowel movements. This is by no means an unwelcome development for most people (see my monograph *The Altered States of Bowel Ecology and Health Preservation*).

Third,

my substantial personal experience with magnesium supplementation in balanced intravenous nutrient protocols has convinced me of its considerable value in many clinical

situations in which ordinarily I would not have used such therapy in the past. I cite one example here. A young man returned from a trip with severe symptoms of influenza, intractable painful muscle spasms and incapacitating fatigue. He improved dramatically after an infusion of Acute Infection Protocol (described later in this monograph). Three days later, he returned with a relapse of severe symptoms. I repeated the same protocol, again with gratifying results. Five days later, he returned with severe depression. He had not been able to sleep because of recurrent nightmares and persistent headaches, dizziness and muscle spasms. I thought about the necessity of hospitalization. He had a long history of severe depression which had required hospitalization and long-term antidepressant therapy in the past. Prior to the influenza infection, he was able to work and follow other pursuits with self-regulatory methods, nutrient support, exercise program and a low dose antidepressant therapy. As a last ditch effort before hospitalization, I administered the Infection Control protocol with an additional 1 gm of magnesium chloride. He slept well without nightmares that night and again the next night. Minor dizziness persisted, but he was able to return to work in three more days.

DISMISSING THE ANECDOTAL

I know many purists in medicine will dismiss the above case study as anecdotal. I reproduce below some text (with some adaptation) from my book *The Cortical Monkey and Healing.*

> ***"When patient with specific diseases do not follow our scripts, we are ingenious in inventing explanations for the bizzare behavior of these patients and their diseases. We call the patients exceptional. We designate their diseases as atypical. When these explanations do not hold up, we have the old reliable anecdotal. This never fails. The surest strategy to discredit clinical observations which do not fit into the molds of diseases described in medical texts is to label them anecdotal. The anecdotal, we are told over and over in medical schools, is the crutch of the feeble-minded. The anecdotal has no place in the serious medical community."***

Little do we realize that all major insights into human biology and all important

discoveries in medicine were based on the anecdotal. Someone observed something which did not fit into the prevailing mode of thought. He elected to ignore the prevailing thought and pursued his own observation, sometimes refuting it with additional observations and sometimes validating it. More importantly, the *anecdotal* is the only thing which counts for *that* single patient. The patient *is* the anecdotal. Little do we recognize that our medical statistics are anecdotes lumped together.

Returning to the subject of growing oxidant stress on cell membranes and cation dynamics, why are the manufacturers of calcium channel blockers so ecstatic about their drugs? How do these drugs suppress symptoms in so many different disorders? What is it that intracellular calcium does in the first place which needs to be prevented by the use of drugs which inhibit calcium ion influx into the cells? Why are physician-nutritionists like myself ecstatic about intravenous magnesium supplementation? How does magnesium supplementation reverse so many different, apparently unrelated disorders? The drug companies are understandably ecstatic about the growing number of therapeutic applications of their calcium channel drugs. More drug uses mean more revenues. The answers to other questions require a deeper understanding of the cell membrane dynamics in health and disease.

MAGNESIUM: NATURE's CALCIUM CHANNEL BLOCKER

Intracellular calcium in concentrations higher than those observed in health is an enzymatic poison. Several lines of clinical and experimental data support this viewpoint. As indicated earlier in this monograph, the Ca^{++} content of mitochondria from ischemic reperfused myocardium is higher than those of the normal myocardium, such mitochondria have a slow rate of ATP production, and these mitochondrial functions improve when excess intracellular calcium is chelated with EDTA[55]. These laboratory observations are supported by the clinical observation of blood pressure lowering effects of calcium channel blocking drugs[56]. These drugs mediate their pharmacologic effects by inhibiting calcium ion influx across the cell membrane of arterial and other muscle cells as well as the conductile and contractile myocardial cells.

Efficacy of magnesium as an anti-hypertensive agent has long been established for certain entities such as eclampsia[52]. Recent studies have clearly demonstrated the therapeutic efficacy of magnesium in status asthmaticus including some patients who were refractory to the standard drug therapies for asthma such as aminophylline and adrenaline[53]. The clinical value of magnesium supplementation, in particular by intravenous route, far exceeds than that seen in the specific examples of hypertensive and bronchospastic crisis.

Many clinical observations and several lines of experimental evidence lead me to think that the pervasive functional magnesium deficiency which we observe in diverse clinical entities is more due to damaged cell membrane and magnesium leakage than it is due to diminished dietary intake. It is well established that the standard American diet makes us magnesium-depleted, potassium-poor and sodium-saturated. But this does not explain why magnesium requirements of patients with chemical sensitivity, immune disorders and chronic fatigue (as determined with magnesium retention tests and clinical benefits observed with oral and intravenous therapy) are generally much larger than those of the general population.

Magnesium supplementation should be administered along with other nutrients in optimally balanced formulations to provide a counterbalance to increased oxidative stress on the cell membrane. Ascorbic acid in large doses and taurine, vitamins A, E and B complex in moderate doses serve this purpose very well. Further, every attempt should be made to eliminate or minimize the biochemical events which increase oxidative molecular stresses in various disease states, i.e., stress, allergy, chemical exposures, altered states of bowel ecology, musculo-skeletal restrictions and painful spasms which occur due to physical inactivity, and viral infections. Magnesium in such a holistic approach is a far superior calcium channel blocker than drugs.

There is one other important issue in this discussion of oxidant stress on cell membrane and divalent cation dynamics. Calcium channel blockers produce clinical benefits by blocking the influx of calcium ions into the cells. These drugs do not reverse the plasma and cell membrane injury (the basic problem of the injured leaky membrane and the molecular events associated with it such as loss of magnesium and potassium) which is the root cause of illness. In the clinical practice of molecular medicine, magnesium therapy is administered as part of a holistic clinical approach with a sharp focus on all the clinically relevant factors which impose excessive oxidant stress on plasma and cell membranes. Selected references for documentation of the antioxidant roles of important nutrients are included in the bibliography[57-75].

PRIMER NUTRIENT PROTOCOLS

Many chronically ill patients who benefit most from intravenous nutrient therapies tolerate poorly the full nutrient doses given in the nutrient protocols that follow. Many patients suffer from a variety of initial symptoms including headache, lightheadedness, lethargy, fatigue and abdominal symptoms. Indeed, full doses of nutrient can exaggerate, albeit temporarily, any or all symptoms that the individual patient suffers as a result of multi-

organ involvement in the accelerated molecular oxidative process which is his true fundamental molecular-energetic derangement. This is a point of considerable clinical importance. My staff and I are very careful in briefing our patients who receive intravenous therapies about this temporary phenomenon. Except for patients with devastating, chronic chemical sensitivities of several years duration, I have not seen chronically ill patients who cannot tolerate or who cannot benefit from intravenous nutrient therapies.

To order to hold to a bare minimum the initial unwanted reactions to intravenous nutrient therapies, I recommend the following Primer I and Primer II Protocols that in my experience have not caused significant problems in the past. These protocols include nutrients that are least likely to cause initial intolerance. In general, it is my practice to prescribe Primer I protocol once to be followed with Primer II once or twice depending upon patient tolerance.

PRIMER I PROTOCOL

Vitamin C	5	gm
Magnesium sulfate	1	gm
Heparin	3,000	units
Sodium bicarbonate	2.5	ml
Dextrose 5%*	500	ml

PRIMER II PROOTOCOL

Vitamin C	10	gm
Magnesium sulfate	1.5	gm
Pantothenic acid	250	mg
Heparin	3,000	units
Sodium bicarbonate	2.5	ml
Dextrose 5%*	500	ml

PRIMER III PROTOCOL

Vitamin C	15	gm	
Magnesium sulfate	2	gm	
Pantothenic acid	500	mg	
Zinc	10	mg	
Multi-minerel	5	ml	
Heaparin	4,000	units	
Sodium bicarbonate	2.5	ml	
Dextrose 5%*	500		ml

* Ringer's Lactate solution may be used instead of dextrose solution if the patient has serious difficulty with handling a sugar load.

BASIC INTRAVENOUS NUTRIENT PROTOCOL

The Basic IV Protocol described below is designed for the convenience of the professional staff preparing the IV protocols. Specific IV protocols described after the Basic IV Protocol can be prepared expediently by adding the necessary additional ingredients or changing the dose of various components. An exception to this is the Chelation Protocol.

Vitamins

Vitamin C	5 gm
Vitamin A	3,300 IU
Vitamin D	200 IU
Vitamin E	10 IU
Biotin	60 mcg
Folic Acid	400 mcg
Niacinamide	40 mg
Riboflavin	3.6 mg
Thiamine	3 mg
Pantothenic Acid	140 mg
Pyridoxine	54 mg
Cyanocobalamine*	1,500 mcg

Minerals

Calcium Glycer/Levu	125 mg
Copper Sulfate	1.6 mg
Chromium	16 mcg
Magnesium Chloride	1,000 mg
Manganese Sulfate	0.4 mg
Molybdenum	25 mcg
Zinc Sulfate	9 mg
Selenium	40 mcg

Rheologic Agents

Sodium Bicarbonate	1.25 Meq
Procaine	60 mg
Heparin	4,000 units

Solution

5 per cent dextrose or 0.45 per cent saline, 450-500 ml
Other fluids for the infusion which may be used on selective basis are Ringer' Lactate or distilled water 450-500 ml.
* Vitamin B_{12} (1,500 mcg) is given separately with an IM injection.

Administration Time

2 to 3 hours

Preparation

The Basic Protocol can be prepared with the following:

Vitamin C (500 mg/ml)	10 ml
Magnesium Chloride (200 mg/ml)	5 ml
Calcium Glycero/Lev (25 mg/ml)	5 ml
Pyridoxine (100 mg/ml)	0.5 ml
Pantothenic Acid (250 mg/ml)	0.5 ml
Multi-vitamin Formula*	10 ml
Multimineral Pack**	4 ml
Zinc (5 mg/ml)	1 ml
Selenium (40 mcg/ml)	1 ml
Molybdenum (25 mcg/ml)	1 ml
Heparin (5,000 U/ml)	0.8 ml
Procaine (2 %)	3 ml
Sodium Bicarbonate (0.5 meq/ml)	2.5 ml

* Multivitamin formula used above contains fat soluble vitamins A,D and E are used in water-solubilized form. Vitamin A 1 mg (3,300 IU); Vitamin D 5 mcg (200 IU); Vitamin E 10 mg=10 IU. Vitamin C solution used here should contain 500 mg/ml (if the solution is 220 mg/ml, use 45 ml).
** Multi-mineral Pack used above contains the following minerals: Zinc, 1 mg/ml; Manganese 0.1 mg/ml; Copper, 0.4 mg/ml; Chromium, 4 mcg/ml.

INACTIVATION OF VITAMIN B_{12} BY ASCORBATE

Cyanocobalamine and hydroxocobalamin are inactivated by ascorbate in the presence of copper and oxygen. Herbert and Jacob reported that meals rich in vitamin B_{12}

homogenized with ascorbic acid in a blender and kept at body temperature for 30 minutes show 50 to 95 % inactivation of cobalamin[76]. Such high rates of inactivation have been shown to be spurious and due to serious methodological errors in the study of Herbert and Jacob[77].

In Intravenous Nutrient protocols, ascorbic acid is usually used in fairly large quantities and carries clear risk of inactivation of vitamin B_{12}. For this reason, it is recommended that vitamin B_{12} dose included in these IV Nutrient Protocols be given separately as an intramuscular injection.

A fall in the blood levels of vitamins A, D and C and folic acid has been observed in patients receiving long-term parenteral therapy with formulations such as Nutri-vite (without additional supplementation as outlined in this monograph). This, however, should be of concern to only those who use unbalanced formulations and do not assure concurrent oral nutrient supplementation support. (See note under Chelation Protocol for Nutri-vite formula.)

ACUTE INFECTION PROTOOCOL

This protocol is recommended for use with acute and chronic viral infections in patients with an impaired immune status. Following are some clinical examples:

History of frequent viral infections with delayed or prolonged resolution.
History of chronic sore throat with dry cough lasting for weeks or even months.
History of pulmonary infiltrates which develop after upper respiratory infections and fail to clear for weeks.
History of chronic persistent fatigue.
History of frequent upper respiratory infections in patients with severe mold and food allergy.
History of autoimmune disorders such as rheumatoid arthritis, vasculitis, SLE, auto-immune thyroiditis and others.
History of recurrent episodes of candida vaginitis and infections with herpes simplex virus, human papilloma virus and other viruses.
Some acute viral infections in otherwise healthy individuals such as acute infectious mononucleosis.

COMPOSITION OF ACUTE INFECTION PROTOCOL

Vitamins

Vitamin C	25 gm
Vitamin A	6,600 IU
Vitamin D	400 IU
Vitamin E	20 IU
Biotin	120 mcg
Folic Acid	800 mcg
Niacinamide	80 mg
Riboflavin	7.2 mg
Thiamine	6 mg
Pantothenic Acid	280 mg
Pyridoxine	108 mg

Minerals

Calcium Gluconate	125 mg
Copper Sulfate	3.2 mg
Chromium	32 mcg
Magnesium Chloride	2,000 mg
Manganese Sulfate	0.8 mg
Molybdenum	50 mcg
Zinc Sulfate	23 mg
Selenium	80 mcg

Rheologic Agents

Same as for the Basic Protocol	
Cyanocobalamine**	1,500 mcg

Solution

5 per cent dextrose or 0.45 per cent saline
Other fluids for the infusion that may be used on selective basis are Ringer's Lactate and distilled water. Volume 450-550 ml.

** Vitamin B_{12} (1,500 mcg) is given separately with an IM injection. Molybdenum (2 ml) is also given as an IM injection to patients with asthma.

Administration Time

2 to 3 hours

Preparation

The Acute Infection Protocol can be prepared by adding the following to the basic Protocol:

Vitamin C (500 mg/ml)	40* ml
Pyridoxine	1 ml
Pantothenic Acid	1 ml
Magnesium Chloride	10 ml
Zinc	3 ml
Multi 4 Mineral Pack	4 ml
Molybdenum	1 ml
Selenium	1 ml

Frequency of Administration

Usually one infusion is enough. A second infusion may be administered on the third day if clinically indicated. See the comments in the section *Efficacy of Nutrient Protocols.*

* The amount of vitamin C may be increased or reduced according to the state of the vein used, presence or absence of symptoms, and the past experience with the infusion of the individual.

ALTERED BOWEL ECOLOGY PROTOCOLS

Vitamins, minerals, and amino acids administered intravenously are very effective for short-term nutritional support for patients with acute exacerbation of chronic bowel disorders and for those with indolent bowel disorders refractory to other therapies. These protocols are also very effective in clinical entities in which serious damage to the immune system preceded the development of the ABE States.

The intravenous route of therapy, bypassing the bowel mucosal barrier, eliminates all problems of absorption. It allows expeditious delivery of these essential elements to all the

tissues. Further, these protocols, when administered with optimal composition of the required ingredients for the specific purposes, provide the tissues ready access to the necessary elements, concurrently and in proportion.

Why introduce yet another term?

The term "atered bwel eology (ABE) sates" is not simply another buzz word to refer to chronic disorders of the bowel. I discuss this subject at length in my monograph *The Altered Bowel Ecology States and Health Preservation.*There are two important reasons why, in my judgement, this term is more appropriate than many others in common use at this time.

First, it keeps the focus on the central issue in our understanding of the pathogenesis of chronic indolent disorders of the bowel, namely the ecology of the bowel. "Ecologic thinking" calls for management of *all* the elements involved in the preservation of the normal ecologic balance in the bowel. Specifically, it includes issues of increased bowel permeability, compromised bowel perfusion, irregularities of bowel motility, impaired digestive and absorptive dysfunctions, altered bowel flora and parasitic infestations.

Second, it keeps the focus on the central issue in the clinical management of chronic indolent bowel disorders, namely the *interrelatedness* of all the elements involved in the preservation of normal ecologic balance in the bowel. Patients with chronic indolent bowel disorders do not obtain relief of symptoms and resolution of their bowel lesions until all these elements are addressed.

The use of diagnostic terms like "Candida-related complex" and "intestinal dysbiosis" is valid for clinical disorders in which there is an unequivocal laboratory evidence of overgrowth or infections with Candida species or other specific microorganisms. Clinical symptom-complex syndromes should be attributed to specific microorganisms only when clear criteria are met, and not simply when the role of an organism is suspected. For instance, the distinction between Shigella colitis and non-specific colitis is very real and essential.

Simplistic efforts to "get rid of the yeast" and "treat intestinal dysbiosis" are rarely effective on a long-term basis. Just as environmentally sensitive individuals require that we address all the relevant environmental triggers, patients with altered bowel ecology states require that we address all the relevant "ecologic" elements in the bowel.

In clinical practice, nutritional disorders and disorders of food allergy, sensitivity and intolerance cannot be separated from the larger issues of bowel ecology. Elements of

significant clinical importance in the preservation of normal bowel ecology include the following: bowel motility and transit time, bowel perfusion, bowel permeability, bowel (and stomach) Ph, bowel digestive capability, bowel absorptive capacity, bowel flora, and most importantly, what I call the "nutrition in the kitchen". Bowel structural changes follow as natural consequences of altered bowel ecology. Specific morphologic lesions such as ulcerative colitis, Crohn's colitis and ileitis, pseudomembranous colitis, ischemic colitis, collagenous colitis and other bowel disorders, in general, represent patterns of cellular and tissue injury caused by long neglected changes in bowel ecology. Intestinal parasitism and colonization with organisms such as Helicobacter species and C. difficile also represent impaired bowel immunity due to altered bowel ecology.

Intravenous Nutrient Protocols described below are given as guidelines to be used in conjunction with oral nutritional protocols described in this volume. Further, I suggest that the physician reader consider integrating these protocols of nutritional medicine with protocols for environmental medicine and self-regulation in his clinical practice. The clinical benefits that I observed with these protocols and described in my books *The Cortical Monkey and Healing, The Butterfly and Life Span Nutrition, The Ghoraa and Limbic Exercise, and The Canary and Chronic Fatigue* were achieved with an integrated clinical approach employing all these protocols on the basis of need for individual patients. To repeat, in applied clinical nutritional pharmacology, as in clinical use of drugs, it is imperative that each patient be treated individually.

Following are two intravenous protocols for the ABE States which I use in my clinical practice and which I find to be very useful. These protocols are safe and effective alternatives to drugs for most patients with the various states of altered bowel ecology. As mentioned above, I describe a Basic IV Protocol for the convenience of the staff preparing these intravenous formulations. Most other IV Protocols that follow can be expediently prepared by adding additional nutrients to the Basic Protocol. Primer I, II and III Protocols, of course, are exceptions.

ACUTE ABE PROTOCOL

I define the term *Acute Altered Bowel Ecology State* as the state in which the bowel (or bowel-related) symptoms are of acute nature and of less than three months duration.

Vitamins

Vitamin C	20 gm
Vitamin A	3300 IU

Vitamin D	200	IU
Vitamin E	10	IU
Biotin	60	mcg
Folic Acid	400	mcg
Niacinamide	40	mg
Riboflavin	3.6	mg
Thiamine	3	mg
Pantothenic Acid	515	mg
Pyridoxine	204	mg
Cyanocobalamine*	2000	mcg

Minerals

Calcium Glycero/Levu	125	mg
Copper Sulfate	3.2	mg
Chromium	32	mcg
Magnesium Chloride	2000	mg
Manganese Sulfate	0.8	mg
Molybdenum	75	mcg
Zinc Sulfate	33	mg
Selenium	160	mcg

Rheologic Agents

As in the Basic Protocol

Solution

Distilled water
Other fluids for the infusion which may be used on selective basis are 0.45 % Saline and Ringers solution. Volume 250 to 400 ml.

* Vitamin B_{12} (2000 mcg) is given separately with an IM injection.

Administration Time

2 to 3 hours

Preparation

The Acute ABE State Protocol can be prepared by adding the following to the Basic Protocol:

Vitamin C	30	ml
Magnesium Chloride	5	ml
Pyridoxine	1.5	ml
Pantothenic Acid	1.5	ml
Zinc	4	ml
Molybdenum	2	ml
Selenium	3	ml
Multi-mineral Pack	4	ml

Frequency of Administration

The Acute ABE Protocol may be administered on once or twice a week basis for five infusions. If additional IV therapy is deemed necessary on the basis of clinical evaluation, it may be continued with the Chronic ABE Protocol as described below. I have not observed any adverse effects of such IV therapy which may be ascribed to the nutrient dose administered.

CHRONIC ABE PROTOCOL

This protocol is intended to provide intravenous nutrient support for people with intractable symptoms of altered states oif bowel ecology of longer than three months duration.

Vitamins

Vitamin C	15	gm
Vitamin A	3300	IU
Vitamin D	200	IU
Vitamin E	10	IU
Biotin	60	mcg
Folic Acid	400	mcg
Niacinamide	40	mg
Riboflavin	3.6	mg
Thiamine	3	mg
Pantothenic Acid	390	mg
Pyridoxine	104	mg
Cyanocobalamine*	2000	mcg

Minerals

Calcium Glycero/Levu	125 mg
Copper Sulfate	1.6 mg
Chromium	16 mcg
Magnesium Chloride	2000 mg
Manganese Sulfate	0.4 mg
Molybdenum	150 mcg
Zinc Sulfate	19 mg
Selenium	100 mcg

Rheologic Agents

As in the Basic protocol

Solution

Dextrose 5 per cent or 0.45 per cent saline
Other fluids for the infusion which may be used on selective basis are Ringer's lactate or sterile water. Volume 500 to 550 ml.

* Vitamin B_{12} (1,500 mcg) is given separately with an IM injection.

Administration Time

2 to 3 hours

Preparation

The Chronic ABE Protocol can be prepared by adding to the Basic Protocol the following:

Vitamin C	20 ml
Magnesium Chloride	5 ml
Pyridoxine	1 ml
Pantothenic Acid	1.5 ml
Zinc	2 ml
Molybdenum	5 ml
Selenium	1.5 ml

Frequency of Administration

Administer a series of five infusion and evaluate the clinical response. Many patients with a history of indolent chronic bowel disorder require follow-up infusions every 4-8 weeks for several months until optimal nutritional status can be maintained with oral nutrient protocols and with the *Nutrition in the Kitchen* (See my monograph *Life-Span Nutrition*).

ASTHMA PROTOCOL

Properly constituted nutritional intravenous protocols are extremely useful in non-pharmacologic management of asthma patients who have been maintained on drug therapy for long periods of time. This is applicable for patients who may wish to discontinue drug therapy because of the increasing risk of serious side effects, and for patients in whom asthma is poorly controlled even with use of multi-drug therapy.

The IV therapy for asthma must be administered as a part of a comprehensive approach which integrates all issues of IgE-mediated allergy (with focus on mold and food allergy), chemical sensitivity, "nutrition in the cooking pot", oral nutrient therapy, self-regulation with focus on limbic breathing and limbic exercise. I recommend my books *The Cortical Monkey and Healing* for training in limbic breathing and my books *The Butterfly and Veteran Dieters* for training in limbic exercise.

Most patients with asthma require limited intravenous therapy (a series of 5 infusions) at the outset of the clinical management. Brittle asthmatics may require intermittent IV infusions for longer periods of time. Needless to say, each asthma patient requires individualized management strategy.

COMPOSITION OF ASTHMA PROTOCOL

Vitamins

Vitamin C	15 gm
Vitamin A	3300 IU
Vitamin D	200 IU
Vitamin E	10 IU
Biotin	60 mcg

Folic Acid	400 mcg
Niacinamide	40 mg
Riboflavin	3.6 mg
Thiamine	3 mg
Pantothenic Acid	515 mg
Pyridoxine	104 mg
Cyanocobalamine*	1,500 mcg

Minerals

Calcium Glycero/Lev	125 mg
Copper Sulfate	1.6 mg
Chromium	66 mcg
Magnesium Chloride	2,000 mg
Manganese Sulfate	0.4 mg
Molybdenum	200 mcg
Zinc Sulfate	16 mg
Selenium	120 mcg

Miscellaneous

Taurine	200 mg

Rheologic Agents

As in the Basic Protocol

* Vitamin B_{12} (1,500 mcg) is given separately with an IM injection.

Solution

Dextrose 5 per cent or 0.45 per cent saline
Other fluids for the infusion which may be used on selective basis are Ringer's lactate or sterile water. Volume 500 to 550 ml.

Administration Time

2 to 3 hours

Preparation

The Asthma Protocol is prepared by adding the following to the Basic Protocol:

Vitamin C	30	ml
Magnesium Chloride	5	ml
Pyridoxine	1	ml
Pantothenic Acid	2	ml
Zinc	3	ml
Molybdenum	7	ml
Selenium	2	ml
Taurine	2	ml

Frequency of Administration

Most patients with asthma can be kept free of asthma drugs and asthma attacks with desensitization of IgE-mediated allergy, oral nutrient protocol and methods of self-regulation and fitness. These patients obviously do not require I.V. therapy on routine basis. However, I do urge them to receive an infusion when they contract viral pharyngeal or respiratory infections. For patients with intractable attacks of asthma and those on steroids, intravenous nutrient therapy is essential for good results (See the section on *Efficacy of Nutrient Protocols).* I administer a series of five infusions and then re-evaluate. In general, such patients benefit considerably from an infusion every 4-6 weeks during winter months or when relevant allergens are in the air.

CHELATION PROTOCOL

EDTA chelation therapy for chemical sensitivity disorders require full knowledge of the molecular basis of chelation phenomenon and diligent attention to many details of intravenous therapy. The initial and subsequent doses of EDTA should be determined with full consideration of the age, weight and height of the patient. For the physician who wishes to incorporate EDTA chelation in his practice, I strongly recommend close adherance to the details of EDTA chelation therapy included in *Protocol of the American College for Advancement in Medicine*, February 1989 edition. Two other important resources are: *1) The Scientific Basis of EDTA Chelation Therapy* by Bruce Halstead, M.D.; and *2) The Syllabus of Chelation Workshop* published by the American College of Advancement in Medicine (800) 532-3688 and (714) 583-7666.

The Chelation Protocol given below is recommended for both reducing the total body burden of toxic heavy metals such as lead, cadmium, mercury, arsenic and others as well as for reversing calcific coronary and peripheral arterial lesions (See my monograph *Chelation therapy).* Chelation therapy must be instituted after complete clinical and laboratory

evaluation (with a special focus on renal function), and integrated with other management protocols of nutritional medicine, environmental medicine, medicine of self-regulation and medicine of fitness.

COMPOSITION OF CHELATION PROTOCOL

EDTA (disodium)*	3	gm
Vitamin C	5	gm
Magnesium Chloride	2,000	mg
Pantothenic Acid	500	mg
Pyridoxine	200	mg
Cyanocobalamine**	1.500	mcg
Sodium Bicarbonate	2.5	Meq
Procaine 2%	60	mg
Heparin (5000 units/cc)	4,000	U

Preparation

EDTA, Disodium Salt	20	ml
Magnesium Chloride	10	ml
Pyridoxine	2	ml
Pantothenic acid	2	ml
Vitamin C	10	ml
Heparin (5000 U/ml)	0.2	ml
Procaine 2%	3	ml
Sodium Bicarbonate	5	ml

Note:

EDTA dose is 1 1/2 gm for the first treatment. Following are some guidelines for adjusting the dose of EDTA according to the weight of the patient in pounds as follows: 100, 2.2 gm; 110, 2.5 gm; 120, 2.7 gm; 130, 2.9 gm; 140, 3.1 gm; 150, 3.4; 160, 3.6 gm; 170, 3.8 gm; 180, 4 gm; 190, 4.3; 200, 4.5 gm; 220, 4.9 gm.

Vitamin B_{12} (1,500 mcg) is given separately with an IM injection at the end of each chelation infusion. The following items [one vial of Nutri-vite (or other preparations with equivalent amounts)] are added to the last approximately 50 ml of the infusion fluid.

Vitamin A	3,3300 IU

Vitamin D	200	IU
Vitamin E	10	IU
Biotin	60	mcg
Folic Acid	400	mcg
Niacinamide	40	mg
Riboflavin	3.6	mg
Thiamine	3	mg
Pyridoxin	4	mg
Pantothenic Acid	15	mg

Solution

Distilled water
Other fluids for the infusion which may be used on selective basis are 0.45 % Saline and Ringers solution. Volume 300 to 400 ml.

Administration Time

3 1/2 to 4 hours

Special Instructions for the patient:

Remind the patient about the following items:

Be prepared for a slow I.V. therapy lasting for about 3 1/2 hours.

Eat a light meal before coming in for treatment and bring a sandwich along for eating during the treatment. The purpose is to reduce the risk of rapid changes in the blood sugar levels.

Take a glass of fresh vegetable juice three times a day on the day before and the day of chelation therapy. Vegetables for preparing juice should be rotated. Preferred vegetables are red beets, celery, carrots, spinach, cucumbers and squashes. Radishes and daikon are excellent unless their taste is found to be too pungent. Preferred fruits are watermelon, apple, berries, grapefruit, pear, and peach. Orange, banana and grapes may be included but sparingly. The purpose here is to provide excellent sources of life-span minerals.

Oral Nutrients

The following
oral nutrient protocols should be taken for one week after each chelation therapy.

TPM Protocol	2 tab three times a day
Calcium Protocol	1 tab twice a day
Mineral Protocol	2 tab three times a day

All regular oral protocols prescribed by the attending physician should be continued during chelation therapy.

Auto-regulation for 15 minutes twice a day.

Unpleasant Effects

Some individuals feel symptoms of heaviness in head, light headache or light-headedness during or within some hours of the treatment. These symptoms are of short duration and do not signify any serious effects of chelation therapy.

Injury to kidneys was reported many years ago when EDTA in large doses (5-10 gm) was given quickly over several minutes. This does not happen when 3 grams of EDTA are given slowly (personal unpublished data).

Local soreness at the sight of the infusion occurs on rare occasions and resolves spontaneously in a day or two. The incidence of phlebitis is extremely low if the infusion is started and maintained with full precautions.

CYTO-PROTECTIVE PROTOCOL

This protocol is designed to provide a life-span counterbalance to the aging-oxidant stress of cyto-destructive therapies such as chemotherapy and radiotherapy for malignant disease. The need for intravenous therapy in these clinical situations is self-evident. Chemotherapy poisons cancer cells and also many healthy non-cancerous cells. Radiotherapy "burns" out the cancer cells and also seriously damages many healthy non-cancerous cells. Intravenous nutritional protocols are intended to protect and stabilize the cell membranes of healthy cell population. See my monograph *On the Agony and Death of a Cell* published in the 1992 Syllabus of the American Academy of Environmental Illness.

COMPOSITION OF CYTO-PROTECTIVE PROTOCOL

Vitamins

Vitamin C	15	gm
Vitamin A	3,300	IU
Vitamin D	200	IU
Vitamin E	10	IU
Biotin	60	mcg
Folic Acid	400	mcg
Niacinamide	40	mg
Riboflavin	3.6	mg
Thiamine	3	mg
Pantothenic Acid	140	mg
Pyridoxine	54	mg
Cyanocobalamine*	500	mcg

Minerals

Calcium Glycero/Levu	125	mg
Copper Sulfate	3.2	mg
Chromium	32	mcg
Magnesium Chloride	2,000	mg
Manganese Sulfate	0.8	mg
Molybdenum	75	mcg
Zinc Sulfate	33	mg
Selenium	120	mcg

Rheologic Agents

As in the Basic Protocol

Solution

Dextrose 5 per cent or 0.45 per cent saline
Other fluids for the infusion which may be used on selective basis are Ringer's Lactate or sterile water. Volume 500 to 5500 ml.

* Vitamin B_{12} (1,500 mcg) is given separately with an IM injection. Molybdenum (2 ml) is

also given as an IM injection to patients suffering from asthma .

Administration Time

2 to 3 hours

Preparation of Cyto-Protective Protocol

The Cyto-Protective Protocol can be prepared by adding the following to the Basic Protocol:

Vitamin C	20	ml
Magnesium Chloride	5	ml
Pyridoxine	1.5	ml
Pantothenic Acid	1.5	ml
Zinc	4	ml
Molybdenum	2	ml
Selenium	3	ml
Multi-mineral Pack	4	ml

Frequency of Administration

The Cyto-Protective Protocol may be administered three to five days before and repeated three to five days after chemotherapy or radiotherapy treatments. The need for additional infusions may be determined in view of the general health of the individual and how adversely it is effected by cyto-destructive therapies.

DETOX PROTOCOL

Tis protocol is intended for use for patients with chemical sensitivity and environmental illness who require intravenous nutrient support as a part of their total care.

I discuss the molecular pathogenetic mechanisms of cellular and tissue injury caused by environmental agents (TGEI dynamics) earlier in this monograph. Chronic clinical disorders caused by environmental chemical sensitivities are enormously complex issues. In my own clinical work, I do not see patients with well-defined chemical sensitivities who do not suffer from antecedent IgE-mediated allergy and food sensitivities. In most cases, patients were given prolonged antibiotic therapy for ear, nose and throat infections or inflammatory conditions such as acne. Frequently these individuals suffer from a plethora

of symptoms attributable, directly or indirectly, to altered states of bowel ecology. Their nutritional status is often compromised with long history of poor eating habits. Multiple specific nutritional deficiencies can be documented with appropriate functional vitamin analysis, amino acid analysis, essential fatty acid studies, and mineral assays.

In my experience, most patients with chemical sensitivities suffer from heavy metal immunotoxicants and neurotoxins such as mercury, lead, aluminum, cadmium, nickel and others. The body burden of these metals can be substantially reduced with D-penicillamine or EDTA used as chelating agents. In my view, such chelation therapy with appropriate intravenous nutrient therapy must be regarded as the cornerstone of therapeutic approach to chemical sensitivity disorders.

COMPOSITION OF DETOX PROTOCOL

Use Chelation and Cyto-Protective Protocols on a weekly rotation.
Duration and sequence of Therapy.

Administer six infusions on weekly intervals and evaluate clinical response.
Administer six infusions on bi-weekly intervals and evaluate clinical response.
Administer one infusion once every four to six weeks until such time that intravenous nutrient therapy is regarded as unnecessary.

Chronic fatigue

Chronic fatigue, in my view, is a state of accelerated oxidative molecular injury. I marshall experimental and clinical evidence for my view in a paper published in the Journal of Advancement in Medicine (1993; 6:83-96). Also, in my view, chronic fatigue will be the dominant chronic health disorder of 21st century. I will also predict that this disorder more than any other will lead to acceptance of intravenous nutrient therapies by the mainstream medical profession. I include some more comments about the nature of this problem of chronic fatigue and give the results obtained with one of my own clinical outcome studies.

Evidence I marshal to support the above hypothesis about chronic fatigue includes the following: 1) Spontaneity of oxidation in nature is the basic nature of the aging process for organisms capable of aerobic respiration, and redox dysregulations represent the initial events that lead to clinical disease processes; 2) The incidence of chronic fatigue in the general population is increasing as is the oxidant stress in the Earth's atmosphere; 3) Molecular evidence for oxidative cell membrane injury in chronic fatigue is furnished by changes in intracellular and extracellular ions — and their molecular consequences — that are consistent with the oxidative hypothesis; 4) Immunologic abnormalities that occur in chronic fatigue are consistent with initial oxidative injury; 5) Commonality of association of antigens of HLA-DR3 region with chronic fatigue syndrome and with other immune disorders such as rheumatoid arthritis, systemic lupus erythematosus, pemphigus vulgaris, and IgA and gold nephropathies; 6) Direct morphologic evidence of increased oxidative stress on the cell membrane is shown by: A) high frequency (up to 80%) of erythrocyte membrane deformities in chronic fatigue, and B) reversibility of these deformities with intravenous antioxidant therapy with ascorbic acid; 7) Changes in electro-myopotentials observed in chronic fatigue are consistent with intracellular ionic and membrane changes seen in chronic fatigue; 8) Clinical entities commonly associated with chronic fatigue are known to increase oxidative molecular stress;and 9) Clinical evidence obtained with relief of fatigue and related muscle symptoms with the use of oral and intravenous anti-oxidant nutrient protocols combined with integrated therapies for allergy, environmental control, self-regulation and slow-sustained exercise. From a clinical standpoint, this model of the molecular basis of chronic fatigue is useful for making therapeutic decisions for successful management of chronic fatigue without drug regimens.

Chronic fatigue cannot be understood through simplistic single-agent-single-disease models that reflect current reductionistic medical thinking, nor can it be successfully managed with narrow-focused attempts that address single issues. What is required is a 'systems study' of man and his environment, a holistic view of the impact upon an individual's genetic make-up of environmental factors, nutritional status, microbiologic

agents, aspects of stress of modern life and fitness-related factors. Rather than fragmentary and isolated studies in epidemiology, immunologic derangement, virology, and clinical response to single pharmacologic agents, we need an integrated program of fundamental research into human enzymatic energy mechanisms and how they are adversely affected by incremental molecular oxidant stress. Recognition, and elimination of specific causes of increased oxidant stress, whenever possible, and nutritional and self-regulatory antioxidant approaches remain the primary approach in the clinical management of chronic fatigue.

CDC Diagnostic Criteria for Chronic fatigue

In 1985, a CDC group of investigators proposed the following three sets of two major criteria (considered essential for diagnosis), eleven minor criteria (6 required for diagnosis), and three physical signs (2 of three required) for the diagnosis of chronic fatigue syndrome[2].

A) Major criteria: 1) new-onset fatigue lasting longer than 6 months; and 2) no other medical or psychiatric conditions that could cause symptoms.

B) Minor criteria: low grade fever, sore throat, painful cervical or axillary lymphadenopathy, generalized muscle weakness, myalgia, fatigue lasting 24 hours or longer after moderate exercise, headache, migratory arthralgia, sleep disorders (hypersomnia or insomnia), neuropsychiatric complaints (one or more of the following: photophobia, visual scotomas, forgetfulness, irritability, confusion, difficulty concentrating, depression).

C) Physical Signs: 1) low grade fever (99.5° to 101.5°); 2) pharyngitis, nonexudative; and 3) cervical or axillary lymphadenopathy.

It is evident from the preceding discussion of the molecular dynamics of chronic fatigue that these criteria are not usable in our model of accelerated oxidative molecular injury. There are two important issues here: 1) How much fatigue interferes with the individual's life?; and 2) What are the molecular basis of chronic fatigue and how can fatigue be alleviated? The CDC criteria hold that chronic fatigue syndrome may not be diagnosed when there exist any organic or psychiatric disorders that can cause fatigue. If chronic fatigue is not caused by organic or psychiatric disorders, how else, one may ask, can chronic fatigue be caused? It is akin to saying that chronic fatigue should not be diagnosed when the treating physician is either a male or a female.

FATIGUE PROTOCOL

Vitamins

Vitamin C	15	gm
Vitamin A	3,300	IU
Vitamin D	200	IU
Vitamin E	10	IU
Biotin	60	mcg
Folic Acid	400	mcg
Niacinamide	40	mg
Riboflavin	3.5	mg
Thiamine	3	mg
Pantothenic Acid	515	mg
Pyridoxine	154	mg
Cyanocobalamine*	1,500	mcg

Minerals

Calcium Glycero/Lev	125	mg
Copper Sulfate	1.6	mg
Chromium	16	mcg
Magnesium Chloride	1,000	mg
Manganese Sulfate	0.4	mg
Molybdenum	150	mcg
Zinc Sulfate	24	mg
Selenium	100	mcg

Misc

Taurine	1,000	mg
Potassium Chloride	6	Meq

Rheologic Agents

As in the Basic Protocol

Solution

Dextrose 5 per cent or 0.45 per cent saline
Other fluids for the infusion which may be used on a selective basis are 0.45 % Saline and Ringers solution. Volume 300 to 400 ml.

* Vitamin B_{12} (1,500 mcg) is given separately with an IM injection.

Administration Time

2 1/2 to 3 hours

Preparation

The Fatigue Protocol is prepared by adding the following to the Basic Protocol:

Vitamin C	10 ml
Magnesium Chloride	5 ml
Zinc	3 ml
Molybdenum	3 ml
Selenium	5 ml
Pyridoxine	2 ml
Pantothenic Acid	1.5 ml
Potassium Chloride (2 Meq/ml)	3 ml
Taurine	2 ml

MINERAL REPLACEMENT PROTOCOL

This protocol is intended for providing intravenous mineral supplementation for a some patients on prolonged EDTA chelation therapy.

It is my clinical practice to insist that patients receiving EDTA chelation therapy drink a minimum of three glasses of fresh vegetable juice — canned, no-salt or low-salt juice if fresh vegetable juice cannot be taken for logistical reasons — on the day before and the day after receiving EDTA infusion. Such mineral supplementation along with optimally-prescribed oral mineral supplementation usually obviates the need for Mineral Replacement Protocol.

Composition of Mineral Protocol

Magnesium Sulfate	1	0.0	ml
Potassium Chloride(2 Meq/ml)		5.0	ml
Zinc Sulfate(4 mg/ml)		3.0	ml
Calcium Glycerophosphate		5.0	ml
Molybdenum(25 mcg/ml)		5.0	ml
Multimineral		5.0	ml
Pantothenic Acid		1.0	ml
Pyridoxin		1.0	ml
Multivitamin		1.0	ml
Heparin		0.8	ml
Sodium Bicarbonate(44 Meq/L)	1	2.0	ml
Sterile water	50	0.0	ml

Administration Time

150 to 180 minutes

****

Apart from the issue of mineral deficiencies that develop with long-term chelation therapy is the issue of essential mineral deficiencies in people with chronic immune and degenerative disorders. The pervasive use of pesticides, herbicides, and insecticides (organophosphate, organochlorines, trichlorophenoxyacetic acid and related derivatives such as agent orange) has profoundly affected the food cycles. Vegetables and fruits grown in areas with heavy exposure to these chemicals contain smaller quantities of minerals than those grown in areas without such contamination.

Deficiencies of minerals such as iron and calcium are easily documented, and hence are well-recognized. The deficiency of other minerals such as zinc, magnesium, manganese, molybdenum and boron are not so easy to document, and hence often go unrecognized.

Mineral Protocol is recommended when severe deficiency of one or more minerals is clinically suspected and documented with appropriate red cell and 24 hour urinary output studies.

OXIDATIVE MOLECULAR STRESS (OMS) PROTOCOL

Human biology is under enormous oxidative stress. How do our lives differ from those of our ancestors a mere hundred years ago? A hundred years ago, the major threats to the survival of our ancestors were imposed upon them by infectious agents. Today, the major threats to our survival are imposed upon us by synthetic chemicals and toxic heavy metals and the stress of modern living. The prevailing medical thought of the nineteenth century was dominated by the microbial threat. Today, the prevailing medical thought should be dominated by the oxidative threat. Regrettably, this is not the case at present. Why? Because we continue to seek answers to the medical problems of late 20th century with an early 19th century thinking.

What are the dominant chronic problems of our young? Epidemics of feeling "not healthy", chronic fatigue, mood and memory difficulties, "spreading allergies", chemical sensitivities, environmentally-induced illnesses, chronic headache, joint and muscle disorders, recurrent viral infections, rapid hypoglycemic-hyperglycemic shifts, adrenergic hypervigilance,. and autoimmune disorders of thyroid, vessels, pancreas and other body organs. These are the consequences of a food chain which is based on chemical agriculture, minute by minute exposure to environmental pollutants, electromagnetic pollution, and relentless stress. What is the common denominator in all these? Oxidative molecular injury.

The Oxidative Molecular Stress Protocol is designed with a focus on providing a counterbalance to excessive action of the aging-oxidant molecules. In its composition, it is similar to the Fatigue Protocol. I have given it a distinct designation so that it may be used for patients with clear clinical and biochemical evidence of increased oxidative stress who do not suffer from indolent fatigue. Specifically, this protocol is useful for patients with a host of autoimmune disorders. The laboratory evidence for increased oxidative stress and autoimmune tissue injury may include one or more of the following:

Presence of auto-antibodies (ANA, anti-double strand DNA, anti-thyroid antibodies and others). Lymphopenia and reduced number of Helper T lymphocytes.

Increased blood levels of complement C31 and decreased levels of C3 and C4.

Fluctuating blood complement levels, in general, correlate well with clinical disease. Total CH50 levels often remain normal.

IgE antibodies with specificity for Candida and other molds.

Raised ESR and monoclonal gammopathy.

Vitamins

Vitamin C	20	gm
Vitamin A	6,600	IU
Vitamin D	400	IU
Vitamin E	20	IU
Biotin	120	mcg
Folic Acid	800	mcg
Niacinamide	80	mg
Riboflavin	7.2	mg
Thiamine	6	mg
Pantothenic Acid	530	mg
Pyridoxine	108	mg
Cyanocobalamine*	1,500	mcg

Minerals

Calcium Gluconate	125	mg
Copper Sulfate	3.2	mg
Chromium	32	mcg
Magnesium Chloride	2,000	mg
Manganese Sulfate	0.8	mg
Molybdenum	100	mcg
Zinc Sulfate	23	mg
Selenium	200	mcg

The OMS Protocol is prepared by adding the following to the Basic Protocol:

Vitamin C	30	ml
Magnesium Chloride	5	ml
Pyridoxine	1	ml
Pantothenic Acid	2	ml
Zinc	2	ml
Selenium	4	ml
Molybdenum	4	ml
Nutrivite	1	Vial

PAIN PROTOCOL

This protocol is intended for use for patients who suffer from intractable chronic pain syndrome and respond poorly to the standard therapies for acute and chronic pain syndromes. For chronic musculoskeletal pain syndromes, myofascial trigger points, and neck and back pain syndromes, I strongly recommend prolotherapy with 50 per cent glucose solution with equal volumes of 2 per cent lidocaine solution and/or neural therapy injection therapy.

Vitamins

Vitamin C	5	gm
Vitamin A	3,300	IU
Vitamin D	200	IU
Vitamin E	10	IU
Biotin	60	mcg
Folic Acid	400	mcg
Niacinamide	40	mg
Riboflavin	3.5	mg
Thiamine	3	mg
Pantothenic Acid	140	mg
Pyridoxine	204	mg
Cyanocobalamine*	1,500	mcg
Sodium Bicarbonate	1.25	Meq
Procaine 2%	3	ml
Heparin (5,000 units/ml)	0.8	ml

Minerals

Calcium Gluconate	125	mg
Copper Sulfate	1.6	mg
Chromium	66	mcg
Magnesium Chloride	2,000	mg
Manganese Sulfate	0.4	mg
Zinc Sulfate	8	mg

* Vitamin B_{12} (1,500 mcg) is given separately with an IM injection.

Solution

Dextrose 5 per cent or 0.45 per cent saline
Other fluids for the infusion which may be used on selective basis are Ringer's lactate or sterile water, Volume 500 to 550 ml.

I.M. Injection

ADP 2 ml (add this to Vitamin B_{12} injection)

Administration Time

2 1/2 to 3 hours

Preparation

The Pain Protocol is prepared by adding the following to the Basic Protocol:

Magnesium Chloride	5 ml
Pyridoxin	1 ml
Pantothenic Acid	1 ml

Comments:

Pyridoxine 5' phosphate (100-200 mg), **pantothenic acid** (250-500 mg), and **magnesium** (1,500-2,000 mg) may be given as a slow intravenous bolus injection over a period of ten minutes with careful monitoring of the cardiac rhythm rather than as an intravenous infusion. Such an IV bolus injection, however, does not carry the general benefits of ascorbate and other nutrients included in the full protocol. This therapy may be administered on alternate or every third day in light of clinical response obtained with the first therapy.

Colchicine (1 mg intravenous injection) followed by one sixth mg orally is very effective as an adjunct therapy for chronic backache and a host of other chronic musculo-skeletal pains.

Boron (5 mg) orally is effective as an adjunct therapy for chronic bone pain caused by metastatic pain.

Adenosine monophosphate (150-200 mg intramuscular injection) combined with vitamin B_{12} 1,000 ug is effective as an adjunct therapy in many patients with post-herpetic neuralgic

pain. If the initial response to these two drugs is good but symptoms persist, a second injection may be given after two to three days. The potential for side effects can be reduced by administering these agents in two divided doses given 15 to 30 minutes apart.

Acupuncture trigger point injections with a solution of 2% lidocaine or Marcan (two parts) and Serapin (one part) are effective as an adjunct therapy for chronic musculo-skeletal pain associated with cervical and lumber spine lesions.

Autoregulation

This in my experience is the single most effective approach for long-term control of suffering in chronic pain disorders. Relief of both generalized and localized muscle spasms with self-regulatory method is not only "do-able", it is imperative for long term relief of acute and chronic pain syndromes in which persistent muscle spasms triggered by a variety of mechanisms is the primary pathogenetic mechanism for pain.

Beyond these muscle considerations, are the critically important issues of perpetuation of pain even when the initiating factors are not operative any more. The suffering in chronic pain disorders comes as much from *remembered pain and feared future pain as* it does from ongoing pathologic lesions. The *remembered* and *feared future* pains are potent causes of unremitting muscle spasm, tightened arteries, cramping bowel and sensory pains. Throughout recorded history, man has had an abiding interest in the subject of self-regulatory control of chronic pain. Many self-regulatory methods give predictable patterns of non-pharmacologic pain control. I describe and discuss several effective self-regulatory methods in detail in my books *The Cortical Monkey and Healing* and *The Dog and Directed Pulses*.

The nutritional intravenous protocol given above, and the adjunct oral or intramuscular therapies suggested for concomitant use, should be used only as temporary non-pharmacologic therapies until such time that the patient can be taught effective self-regulatory methods for pain control.

PRE- AND POST-OPERATIVE PROTOCOLS

This protocol is intended to provide intravenous nutrient support for elective and emergency surgical procedures.

Wound healing is a function of concomitant inflammatory and repair responses. Healing tissues require nutrients in substantially larger quantities than non-healing tissues. It is usually not possible to provide large quantities of nutrients pre-operatively with oral supplementation formulas. This is clearly not achievable during the immediate post-operative

states following abdominal surgery.

The purpose of these brief comments, again, is to put the use of intravenous nutritional protocol for surgery into proper perspective. It is intended to provide a high gradient of nutrients across the various plasma and cell membranes.

Vitamins

Vitamin C	10	gm
Vitamin A	6,600	IU
Vitamin D	400	IU
Vitamin E	20	IU
Biotin	120	mcg
Folic Acid	800	mcg
Niacinamide	80	mg
Riboflavin	7.2	mg
Thiamine	6	mg
Pantothenic Acid	140	mg
Pyridoxine	54	mg
Cyanocobalamine*	2,000	mcg
Sodium Bicarbonate	1.25	Meq
Procaine 2% (3 ml)	60	mg
Heparin (5000 units/cc)	4,000	units

Minerals

Calcium Glycer/Levu	125	mg
Copper Sulfate	1.6	mg
Chromium	16	mcg
Magnesium Chloride	2,000	mg
Manganese Sulfate—	0.8	mg
Molybdenum	50	mcg
Zinc Sulfate	16	mg
Selenium	80	mcg

Misc.

Travasol**	200	ml

* Vitamin B_{12} (2000 mcg) is given separately with an IM injection.

Solution

Dextrose 5 per cent or 0.45 saline
Other fluids for the infusion that be used on a selective basis are Ringer's lactate and sterile water. Volume 500 to 5500 ml.

Administration Time

2 1/2 - 3 HOURS

Preparation

The Pre-OP Protocol is prepared by adding the following to the Basic Protocol:

Vitamin C	10 ml
Magnesium Chloride	5 ml
Multi-vite	10 ml
Nutri-Dox	0.5 ml
Nutri-Pan	0.5 ml
Zinc	3 ml
Molybdenum	1 ml
Selenium	3 ml
Cyanocobalamine**	2,000 mcg
Travasol***	200 ml

Solution

Distilled water
Other fluids for the infusion which may be used on a selective basis are 0.45 % Saline and Ringers solution. Volume 500 to 550 ml.

** Vitamin B_{12} (1,500 mcg) is given separately with an IM injection. Molybdenum (2 ml) is also given as an IM injection to patients with asthma .

*** 100 ml of Travasol with Electrolytes contains the following:

Essential amino acids in mg :
Leucine 526, Phenylalanine 526, Lysine 492, Methionine 492, Isoleucine 406, Valine 390, Histidine 372, Threonine 356, Tryptophan 152.

Non-essential Amino Acids in mg:

Alanine 1,760, Glycine 1,760, Arginine 880, Proline 356, Tyrosine 34.

Electrolytes in Meq :
Sodium 70, Potassium 70, Magnesium 10, Acetate 141, Chloride 70, Phosphate 60.

TRAVASOL with electrolytes is sold by Baxter.

Efficacy of Intravenous Protocols

I reiterate here for emphasis three points I made earlier in this monograph. First, nutrient therapy as recommended here is not intended to correct any putative nutrient deficiencies. Rather, nutrients are used for their diverse metabolic roles and for providing an antioxidant counterbalance to ever-increasing oxidant stress on human biology. Second, these nutrient therapies must be integrated with other non-drug management protocols of molecular medicine. Third, the efficacy of these nutrient protocols must be assessed with outcome criteria rather than the conventional double-blind cross-over methods of "drug research" which is utterly irrelevant to the clinical practice of molecular medicine.

A growing number of studies have been recently published to test the validity of one or more of the precepts of molecular medicine as outlined here. For example, improvement in nonverbal intelligence was observed in Welsh schoolchildren given vitamin and mineral supplementation for eight months[76]. It amuses me to learn that the Medical Research Council of Britain found "no convincing physiological explanation of the results"[77]. Treatment with vitamin A reduces morbidity and mortality in measles, prompting the investigators in this study to recommend that "all children with severe measles should be given vitamin A supplements, whether or not they are thought to have a nutritional deficiency."[78]. Indeed, vitamin A deficiency is known to increase morbidity and mortality in every known infectious disease[79]. In a community trial of 28,630 children in Nepal, vitamin A supplementation alone reduced the overall mortality by 30% among children aged 6-72 months[80]. Vitamin deficiencies have been documented in all studies of chemically sensitive patients reported so far.[81] Reduced blood levels of vitamin E relate inversely to the risk of angina pectoris after adjustment for age, smoking, blood pressure, lipids and relative weight[82,83].

It is not within the scope of this monograph to include a comprehensive review of the literature pertaining to the use of vitamins and other nutrients for which "no convincing physiologic explanation" can be found by my colleagues in drug medicine — what convincing *physiologic* explanations exist when we use drugs except hormones and few other agents, may I ask?. These few citations are intended to support the viewpoint that the use of nutrients to "treat deficiency disease" alone is a serious error in clinical medicine.

I discuss earlier in this monograph the absolute need for a holistic approach in the clinical practice of molecular medicine which integrates *all* the necessary protocols of environmental medicine, nutritional medicine, medicine of self-regulation and medicine of fitness. This clinical approach is essential for best clinical results. However, it does make it difficult to assess the precise contribution made by individual therapeutic elements in the total management of a given individual. Following are the *outcome* criteria I use in my clinical practice to *clinically* assess the benefits obtained with the intravenous nutrient protocols

described in this monograph.

First,

a comparative study of the long-term (months to years) clinical responses of groups of patients with these states managed with and without intravenous nutrient protocols.

Second,

the long-term clinical responses of individual patients who serve as their own "controls". I first chose to manage these patients without intravenous protocols and later decided to add intravenous therapy in view of unsatisfactory initial response.

Third,

the immediate (hours to days) clinical responses of patients incapacitated with severe symptom-complexes attributable to different organ-systems.

I reiterate here for emphasis that I made no attempts in this work to diagnose putative nutritional deficiencies before embarking upon intravenous therapy. I discuss at length my *molecular* reasons for defying the twin restrictive (and destructive) dogmas of nutrients for nutritional deficiencies and double-blind cross-over methods of drug research. Indeed, molecular medicine cannot be practiced until the physician has the intellectual capacity to break through these barriers.

Following are some specific comments about my personal observations about the clinical efficacy of these protocols.

Acute Viral Pharyngeal and Respiratory Infections

These are disorders in which the drug therapy almost uniformly gives dismal results and where intravenous nutrient therapies almost uniformly give very gratifying results. It is extremely rare for me to prescribe antibiotics for such infections. My management protocols for such infections emphasize the use of ascorbic acid (1-2 grams hourly on the first day, half as much on subsequent days), gargles with cod liver oil or water-solubilized forms of vitamin A and E, chicken soup (salt prevents dehydration except when it is contraindicated due to heart disease, etc.) and good nursing care. I recommend early use of intravenous protocols for all my patients with fatigue syndromes, autoimmune and immunodeficiency syndromes, and altered bowel ecology states where antibiotic therapy usually gives disastrous results. For other patients I recommend IV therapy if they do not feel clear evidence of resolution ("the

back of the virus is not yet broken") after 48 hours of therapeutic trial of above measures.

Provocation/neutralization with flu vaccine is very useful in relieving symptoms of these infections. But this procedure does not protect the patient from accelerated oxidative molecular damage caused by such viral infections[83].

Approximately two thirds of patients respond dramatically to a single infusion of the Infection Control Protocol. The remaining one third require a second and on rare occasions a third infusion. It is extremely rare for me to see such therapy give no demonstrable results in any patient.

In summary, IV therapy for viral pharyngeal and respiratory infections unfailingly contributes toward relief of symptoms and provides critically needed counterbalance to accelerated oxidative molecular damage induced by viral agents.

The ABE States

The patients with the Altered Bowel Ecology States almost always show laboratory evidence of IgE-mediated allergy and clinical evidence of functional nutritional deficiencies. I consider the use of these IV protocols only after I have completed my clinical and laboratory evaluation of the case and have initiated my environmental, oral nutritional, stress and fitness protocols.

It has been difficult for me to collate data for patients with Altered Bowel Ecology States. These individuals also frequently suffer from fatigue or pain syndromes, and as such are given IV protocols for those more easily defined clinical situations. Nonetheless, the relief of bowel-associated symptomatology and other symptoms apparently unrelated to the bowel has been very satisfactory for the patients as well as me in most instances. We are able to discontinue drug therapy in most cases. The exceptions to this are patients with a long history of use of steroids and other drugs such as azulfadine. I reiterate for emphasis that patients with chronic indolent bowel disorders require a comprehensive holistic approach which addresses all the relevant issues of food and mold allergy, chemical sensitivity, stress, nutrition and fitness for long-term good clinical outcome.

Asthma

On the following page, I quote below from the abstract of one of my outcome studies published in the proceedings of the 26th Annual Meeting of the American Academy of Environmental Medicine in 1991.

"The analysis of the outcome data showed the following: all regular use of bronchodilators was successfully discontinued in 34 (77%) patients. Uncommon recurrences of asthma in this subgroup were successfully managed with IV therapies. The regular use of bronchodilators was reduced by more than 50% in 4 (9%) patients and by about 25% in the remaining 6 (11%). In the steroid dependent group of 11 patients, steroid use was discontinued in 4 (35%) and reduced by about 50% in another 3 (27%). The steroid and regular bronchodilator use could not be discontinued in the remaining patients."

I reiterate for emphasis. The above results were not obtained with the exclusive use of intravenous nutrient therapy. Rather, these clinical benefits were drawn from integrated holistic management plans with focus on desensitization of IgE-mediated allergy, environmental controls, oral nutrient therapy, and previously described methods of Limbic Breathing and Limbic Exercise.

Fatigue Syndromes

Strong clinical evidence for my viewpoint that chronic fatigue is a state of accelerated oxidative molecular injury is furnished by outcome studies demonstrating the efficacy of intravenous anti-oxidant nutrient therapies. Of the 100 consecutive patients with the chief complaint of chronic fatigue who were treated at the Chronic Fatigue Clinic at the Institute, 46 met the CDC criteria for chronic fatigue syndrome. IgE antibodies with specificity for at least three mold antigen were present in all 100 patients. Eighty eight patients gave a history of extensive antibiotic therapy and symptoms indicative of altered states of bowel ecology. Elevated blood levels of one or more heavy metals (Pb, Hg, Al, Cd and As) were found in 37 patients. Serologic evidence for active viral replication was not detected in the majority of patients. Major stress (as assessed by the patient) preceded the onset of chronic fatigue in less than 10% of patients. All patients were managed with integrated treatment protocols of oral and intravenous nutrient therapies, antigen immunotherapy for IgE-mediated allergy, training in effective methods for self-regulation and a program for slow, sustained exercise. The intravenous nutrient protocol was formulated to provide a strong nutrient anti-oxidant support, and not to correct any putative nutritional deficiencies. The outcome data for these 100 patients with chronic fatigue was as follows: Excellent response (symptom relief > 80%),

68%; good response (symptom relief between 60% and 80%), 12%; modest response (symptom relief between 40% and 60%); and poor response (symptom relief between 0 and 40%), 12%.

What has been my long-term experience with such "failures"? Some of my patients discontinued further therapy for a variety of reasons. Indeed, it is a very rare individual who proves to be completely refractory to IV therapy after a therapeutic trial period of three to six months.

Pain Syndromes

Acute and chronic musculo-skeletal pain syndromes require comprehensive clinical evaluation. Self-regulatory methods for dissolving muscle spasms, physical methods including physiotherapy and hydrotherapy, and manipulation procedure are essential elements in the clinical approach to pain disorders.

I obtain good results with injection of precisely localized myo-fascial trigger points with a solution composed of equal volumes of 50% dextrose and 2% lidocaine. For generalized pain and spasms in the low back and neck muscles, I use injection of equal volumes of 2% lidocaine and Serapin into the acupuncture trigger points. These injection techniques are safe and effective and completely free of any adverse effects except the potential of a hypersensitivity reaction in rare instances.

I use intravenous nutrient therapy (with emphasis on magnesium and pyridoxin) as an adjunct therapy in cases where the above methods failed to give me satisfactory results. This is one clinical situation in which I let the patient guide me almost completely when it comes to the frequency of IV therapy after the first two infusions. Almost 90% of patients with chronic pain syndrome report good results though the benefits generally last for a short time. The clinical response in acute pain syndrome occurs in roughly similar number of patients though many such patients obtain complete relief after just one or two infusions.

Pre-Operative and Post-Operative Protocols

DR, one of my patients, in mid-fifties, recently underwent a right hepatic lobectomy for a metastatic colon cancer. I administered Pre-Operative Protocol on two occasions, six and three days before surgery, and taught him limbic breathing for pain control. He surprised his surgical team by taking only a single injection of demerol for pain and by walking on the second post-operative day. He left the hospital on the sixth day. I gave him one additional

infusion on the day after he was discharged from the hospital.

MD, one of my patients in her early thirties, underwent a partial mastectomy for a mammary carcinoma. She requested her anesthesiologist to add some vitamins to her intravenous infusion during her stay in the recovery room. The anesthesiologist was reluctant to do so. When she insisted, he asked her if she meant the yellow stuff. She expressed her ignorance about the yellow stuff. The anesthesiologist promised to check with the hospital pharmacist. It is a sad comment when the only thing a physician knows about nutritional supplements is the color they produce when added to the intravenous infusion.

It has been my practice for some years to recommend pre-operative and post-operative intravenous nutrient therapy for all patients facing elective surgery. This clinical experience has convinced me of significant benefits of this therapy. It is my prediction that such therapies will be commonplace in our hospitals when the patients and their physicians become familiar with the enormous benefits of intravenous nutritional protocols.

I end this monograph on the note with which I started this. I hope the intravenous nutrient protocols described here will be tried by physicians who presently do not use such therapies, and will be validated, modified or refuted in the best traditions of science. Clinical practice of molecular medicine requires a different way of thinking. It requires an intellectual adaptation from treatments based on morphologic diagnosis of diseases established by microscopic study of tissues *after* they have been injured to rational and scientifically sound therapies based on molecular dynamics in health *before* the tissues have been injured. The exponential growth in the disciplines of molecular biology and molecular pathology which we have witnessed during the past few years is paving the way for this intellectual adaptation. In this new medicine, the central concept in our understanding of health and disease is holistic molecular relatedness in human biology and the core idea behind our therapeutic strategies is a holistic commitment to treatment protocols of nutritional medicine, environmental medicine, medicine of self-regulation and medicine of physical fitness for every single patient.

Nutrient Intravenous Bolus Therapies

I indicated earlier that I prefer slow (60 to 90 minutes) intravenous nutrient infusions to rapid (seven to fifteen minutes) intravenous bolus therapies for two main reasons. First, infusions allow administration of much larger quantities than is possible with bolus therapies. Second, there is less chance of provoking untoward reactions with slow infusions than with rapid boluses. These reactions include systemic reactions to vitamin B complex components as well as the possibility of adverse impact on cardiac rhythm of rapid magnesium boluses. The principal advantage of bolus therapy is logistical ease of administration.

I include below some suggestions for constituting nutrient intravenous bolus therapies. For this purpose, I have drawn heavily on the clinical results observed by many of my colleagues with extensive clinical experience in nutritional medicine.

BASIC INTRAVENOUS BOLUS PROTOCOL

First Bolus

Pantothenic Acid	1.5 ml
Pyridoxin	1.0 ml
Vitamin B Complex	0.5 ml
Magnesium Sulfate	5.0 ml
Zinc	3.0 ml
Calcium Glycerophosphate	3.0 ml
Multimineral	2.0 ml
Sterile Water	40.0 ml

Second Bolus

Ascorbic Acid	5.0 ml
Sterile Water	30.0 ml

Administration Time

10 to 15 minutes

Additional Component

Vitamin B_{12} 1,500 mcg (1.5 ml) as a separate IM injection

VITAMIN C PROTOCOL

Ascorbic Acid*	10.0	ml
Sterile Water**	50.0	ml

* The amount of ascorbic acid may be reduced to five or seven grams in view of the clinical state under management.

** The volume of sterile water may be increased to 60 or 75 ml or reduced to 30 or 40 ml when using lesser amounts of ascorbic acid.

Administration Time

10 to 20 minutes

TPM-Cal PROTOCOL

One of the oral nutrient protocols I use liberally, and with good clinical response , for states of accelerated oxidative cell membrane injury associated with immune and degenerative disorders is TPM — composed to taurine (250 mg), potassium xxx mg and magnesium xxx mg). I wrote earlier that injured plasma membranes lead to hemorrhage out of what is inside the cells — magnesium and potassium — and flooding of cell innards with what is outside them — calcium in excess being a major adverse effect of cell membrane injury. Taurine, a major cellular antioxidant, of course, plays a role in repair of the cell membrane damage.

In clinical states requiring such nutrient support by intravenous route, I recommend the TPM-CAL Protocol. Again, I repeat, my personal preference in such clinical setting is to use OMS (Oxidative Molecular Stress Protocol) described earlier in this monograph.

Composition of TPM-Cal Protocol

Magnesium Sulfate	5.0	ml	
Potassium Chloride	3.0	ml	
Taurine(100 mg/ml)	2.0	ml	
Dextrose 5 per cent	2	0.0	ml

Additional Component

Vitamin B_{12} 1,500 mcg (1.5 ml)

Administration Time

Ten to fifteen minutes

OXIDANT PROTOCOLS

Intravenous oxidant therapies — hydrogen peroxide infusions and hemo-ozone autotransfusion — are poorly understood but effective therapies. Charles Farr, M.D. and his co-investigators have documented the clinical efficacy of hydrogen peroxide therapy for a host of immune, degenerative and infectious processes with extensive clinical experience. My own rather limited experience appears to be consistent with that described by Farr and co-investigators.

On the surface, the use of oxidative therapies to manage clinical states characterized with accelerated oxidative molecular would be expected to be contraindicated. How do oxidant therapies work? Conceptually, my sense is that oxidant therapies work by modulating the redox homeostasis, probably in the same way the use of a cardiac defibrillator restores the sinus cardiac rhythm (often after a phase of cardiac arrest.) A second clinical corollary that may be cited to support my viewpoint is that of electroconvulsive therapy for depression. In a sense, the phenomenon observed commonly with provocation/neutralization technique for diagnosis and management of food sensitivities — provocation of certain energetic-molecular events followed by restoration of normal homeostasis — also appears to be of similar nature. This proposed mechanism of action of oxidant therapies, however, remains speculative at this time and valid experimental evidence for it is not forthcoming at this time.

Nitric acid and hydrogen peroxide are two molecules that , in my view, will prove to be of great clinical value in designing non-pharmacologic therapies for reversing chronic immune and degenerative disorders, and in the management of certain acute infectious processes. Nitric acid production and disposal are some of fundamental events that occur at peripheral level and regulate vascular tone — and so influence perfusion of tissues. The effects of nitric acid on the vascular tone are largely mediated by its effects on the muscle fibers. There is some clinical evidence that nitroglycerine may be of some clinical efficacy in the management of chronic fatigue.

Production and breakdown of hydrogen peroxide is one of the initial redox events that results from the activities of a host of enzymes such as oxidases, oxygenases (cyclo-oxygenases, lipo-oxygenases, peroxidases), myeloperoxidase, catalase and other related enzymes of redox homeostasis. Through these various reactions, hydrogen peroxide plays critical roles in the metabolic pathways involved in building up and breaking down various carbohydrates, lipids and proteins. Hydrogen peroxide production and degradation is also one of the initial responses of polymorphonuclear leukocytes to an assault by various microbial organisms is production of hydrogen peroxide.

HYDROGEN PEROXIDE PROTOCOL

This protocol is intended for use along with other intravenous nutrient protocols in some patients who respond poorly to therapy. Before using this protocol, I strongly urge the reader to familiarize himself with several important issues relating to hydrogen peroxide therapy discussed at lenght in a monograph entitled *Workbook on Free Radical Chemistry and Hydrogen Peroxide Metabolism* prepared by Charles H. Farr, M.D. and published by IBOM Foundation (405-691-1112).

Hydrogen Peroxide 3.75%	0.35 ml
Sodium Bicarbonate	2.5 ml
DMSO	1.0 ml
Normal Saline*	250.00 ml

Administration Time

1 1/2 to 2 1/2 hours

* Dextrose 5 per cent may be used as the carrying solution.

Intramuscular Protocols

Intramuscular injections are evidently not suitable for administration of large quantities of nutrients. In selected cases, however, limited nutrient support can be provided in an expedient manner. A good example of this in my own clinical experience has been the use of molybdenum and vitamin B_{12} injections for bronchial asthma that I outline below.

MOLYBDENUM/B_{12} PROTOCOL

I use this combination of intramuscular injections for some cases of intractable bronchial asthma that responds poorly to a therapeutic approach that integrates allergen-specific immunotherapy, oral nutrient therapies and effective methods of self-regulation. Also, in some patients I have been able to avoid steroid therapy with the use of molybdenum and vitamin B_{12} therapy.

Molybdenum is a co-factor for sulfite and xanthine oxidases, enzymes that play important roles in the detoxification processes. Through these metabolic roles, molybdenum is valuable in facilitating disposition of certain products of cellular metabolism that increase oxidative stress and trigger bronchospasm. Vitamin B_{12} is administered for several reasons given on pages 7-9 of this monograph.

Molybdenum (25 mcg/ml)	2.0 ml
Vitamin B_{12} (1,500/ml)	1.5 ml

Frequency

Twice a week for four weeks, once a week for another four weeks and then evaluate the clinical response.

LIVER AND B_{12}

This combination is useful for patients with fatigue, malaise and other ill-defined symptoms of poor health.

Crude Liver Extract	2 ml
Vitamin B_{12}	1 ml

MAG/CAL/B

This combination of nutrients is appropriate for providing intramuscular nutrient support for a variety of neuromuscular disorders.

Magnesium sulfate (50%)	3	ml
Calcium Glycerophosphate	5	ml
Hydroxycobalamin (1,000 mcg/ml)	1.5	ml

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Klinghardt Cocktail for heavy metal toxicity

- Materials
  a) Phosphatidyl Choline/Essentiale N/ Lipostabil – 5ml ampules
  b) Use 20ml or 30ml syringe with 23 gauge butterfly needles

- **Procedure Day 1:**
  a) Draw up 2 vials of Essentiale N/ Lipostabil
  b) Draw up 10ml of client's blood into the same syringe
  c) Mix gently
  d) Infuse blood/lipid mix over 5 minutes back into client's vein.
  e) Follow with 1200mg Glutathione IV over 2 minutes.
  f) follow with 2mL of DMPS over 1 minute
  g) follow with 2mL of calcium EDTA
  h) follow with IV vitamin C protocol over 1-2 hours
     500mL glass bottle of sterile water
     37.5 gms vit C
     10mL calcium gluconate
     5 mL magnesium chloride
     5 mL sodium bicarbonate

OR, if time is of a concern you can do a vitamin C push:
6-7mL vit C
2cc calcium gluconate
2cc magnesium chloride
2cc sodium bicarb
35 cc total with water, push over 3-5 minutes

Mineral IV protocol
Optional for day 2 if feeling depleted after chelation

Mineral push:
a) 2cc Magnesium chloride
b) 2cc Calcium gluconate
c) 2cc sodium bicarb
d) 1cc zinc
e) 1cc selenium
f) 2cc trace minerals
g) 1cc potassium
h) Fill remainder of 35cc syringe with saline and push over 5 minutes

OR Mineral drip (especially if more sensitive that day):
a) 5cc Magnesium chloride
b) 5cc calcium gluconate
c) 3cc sodium bicarb
d) 2cc trace minerals
e) 1cc zinc
f) 1cc selenium
g) 1cc potassium
h) Add to 100mL bag of saline and drip over 30 min