Nutritional Treatment for Detoxification and Recovery from Alcoholism: The Functional/ Molecular Medicine Approach
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Introduction
Conventional treatment for alcoholism, or drug dependency, has been focused on mono-therapeutic approaches. The literature is inundated with treatment regimes that are based on medical, counseling, or spiritually-based approaches. Unfortunately, rarely are these protocols used simultaneously and rarely is treatment successful when the holistic approach is ignored. At best, most treatment programs, even those claiming holistic treatment, are bimodal in their approach. And when they are utilized together, nutrition is often overlooked as a necessary component of detoxification and recovery. Certainly, one can find ample information, on the internet and elsewhere, on the nutritional aspects of treatment of alcoholism. However, rarely do these nutritional protocols address the deeper issues. Fortunately, there are leaders in the field of integrative/functional medicine who are changing the way we look at treating chronic disease—nutritionally. Alcoholism is now recognized as a chronic disease. When treatment programs utilize body-mind-spirit approaches with well-designed nutritional protocols, the successes are dynamic. In this monograph we will attempt to introduce the concepts of functional/molecular medicine for the treatment of alcoholism and suggest why studying the deeper issues of nutritional therapy is an absolute necessity for successful detoxification and subsequent successful recovery.

Functional/Molecular Medicine
Functional medicine is a practice of medicine that focuses on holistic treatment of the individual rather than the treatment of the disease symptom. The primary focus is prevention of disease states but it is highly efficient in returning individuals to health even when the disease is created by lifestyle choices. Functional medicine requires that the practitioner understand how things are designed to work, and for what purpose, at the molecular level and how this design/purpose affects the function of the organism as a whole. There is recognition, by the physician, that there are numerous complex actions and interactions that must occur at the cellular levels to keep the patient at optimum health. This complexity is compounded when we accept that each individual is "an island unto himself." The individual nature of each patient must be recognized as well as how his/her disease manifests itself through environmental influences. Functional medicine is not about ignoring science. It is intimately involved with science, yet understands that movement toward science-based health on the physical level must coexist with emotional and spiritual health.

Molecular medicine, and how the environment influences molecular and cellular events, is an integral part of functional medicine. Molecular medicine addresses cellular function and how these functions change through the changing internal and external influences of the individual environment. Unfortunately, molecular medicine without the necessary focused nutritional components along with pharmaceutical drug components is common in the treatment of alcohol and drug dependency. Many times, rather than assist the patient to recovery, the pharmaceutical treatment adds to the chemical burden, resulting in abnormal metabolism at the cellular level. It may be that chemical therapy at this level is sometimes necessary, especially if the patient is a danger to self or others. Yet in our clinical experience, we find this is rarely the case when the program encompasses functional/molecular medicine with nutritional components.

One of the primary advocates of molecular medicine with the nutritional component is Majid Ali, MD. Dr. Ali states that molecular medicine refers to a practice of medicine based on molecular events that occur before cells and tissues are injured by disease. Rather than treat the disease, we should design treatment protocols, based on knowledge of cellular structure and function, which satisfy the cellular requirements of the individual. There is little doubt that the treatment of alcoholism, and drug dependency, benefits from this approach.

Functional medicine has been in the process of conceptualisation for the past decade through the practice of naturopathy, with physicians trained in science and nutrition, and holistically educated medical doctors and health professionals. Since the early 90's, its leading proponent has been Jeffery Bland, PhD. In this article we use functional medicine as meaning both functional/molecular medicine with necessary nutritional/environmental components. In both concepts one thing is abundantly clear—nutritional therapy is not so much about what we eat or drink. Rather, it is about how what we eat or drink—one combination with environmental factors—affects genetic functions and molecular events in the body and mind. Jeffery Bland states, "We are not really what we eat but what we absorb from what we eat." He goes on to point out that gastrointestinal dysfunction (common in alcoholics), causes poor absorption of nutrients.

Nutritional Background
Adequate and balanced nutrition is commonly overlooked in well-meaning detoxification and recovery programs. This is especially true in programs (low or non-funded) that treat the lower economic status clients. While most...
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Programs encourage recovering alcoholics to eat and take basic vitamins and supplements, what is lacking is a clear understanding by most mono-therapeutic treatment programs of the depths of physiological changes caused by alcoholism. Furthermore, most programs have little ability to assess whether the patient can adequately absorb nutrients taken orally.

Time is needed to bring the alcoholic back to an acceptable state of health so that body functions (both physical and mental) can be assessed at baseline conditions. Furthermore, what is missing in many programs is the ability to provide quality nutrients in sufficient quantities (or provide accessibility to these nutrients) to assist the client's recovery through the healing of tissue damage and neurotransmitter dysfunction. The means to deliver these nutrients, especially in the detoxification stages or early in recovery, need to be considered. Furthermore, many alcoholics and drug addicts, having suffered through years of malnourishment, suffer profound and possibly irreversible physiological changes which intensify discomfort in recovery and, for many, lead to relapse. Embedded in the multi-disciplinary approach is an intense focus on nutritional deficits and the profound long-term effects of chronic malnutrition and alcohol intoxication.

Proper intake of oral nutrition — including water, proteins, carbohydrates, fats, vitamins, and minerals — is the absolute basis of our health and mental well-being. All treatment interventions must start with an assessment of nutritional status of the individual. Treatment will be less effective if the patient has impaired cognitive function due to nutritional deficiencies from the long-term effects of alcohol and/or drug abuse. Proper hydration may be the most important factor since every biochemical process in the human body operates in a fluid matrix. Fluid is essential in transporting nutrients and removing waste products in and out of cells. It is necessary for all digestive, absorption, circulatory, and excretory events, as well as the absorption of water-soluble vitamins. Proteins supply energy as well as needed building blocks for hormones, neurotransmitters, antibodies, enzymes, and help maintain the proper acid-alkali balance of the body. Carbohydrates supply necessary energy along with fiber which keeps gastrointestinal function normalized. Fats are essential in providing energy and support cellular function. In addition, proteins, carbohydrates, and fats are also integral parts of cellular membranes and membrane function. It is also well known that alcohol interferes with the absorption of nutrients, especially vitamins. Vitamins, which are essential for life and good quality health, are cofactors (also known as coenzymes) for enzymatic processes in the body. Additionally, two vitamins, vitamins A and D, are considered hormones. The major macro-minerals — sodium, potassium, calcium, and magnesium — function in energy metabolism, membrane transport, and the maintenance of the membrane potential. Also necessary for life, and of special importance, are the micro-minerals — chromium, copper, iron, selenium, and zinc. Common nutrient deficiencies in alcoholics are thiamine, folic acid (most common deficiency), Vitamin B-12, niacin, riboflavin, Vitamin B-6, zinc, Vitamin C, and Magnesium. Any process that interferes with the above numerous oral nutrients can cause disease states. But most of the time these disease states remain subclinical — especially in alcoholism.

The fact that nutrition has often been overlooked in the past in the areas of pharmacology, standard medical practices, and treatment of addiction is not surprising. More than two-thirds of the medical schools in the United States still do not have a specific nutrition course in their curriculum. 2 This ongoing failure to teach nutrition and practice nutritional medicine is embedded in the idea that we get our recommended daily allowance (RDA) of nutrients if we eat within certain defined parameters. There is a clear understanding now that even RDAs of these nutrients, established by the Food and Nutrition Board of the National Academy of Sciences (NAS) in 1941, may keep subclinical disease states subclinical. Because the RDAs for vitamins are minimum amounts that will only prevent the signs and symptoms of deficiency diseases, the daily intake should often be higher than recommended. This is especially true for treatment of alcoholism. Furthermore, however well RDAs work as a guideline, for any given person, they may be an underestimate or overestimate of the amounts actually needed for any specific health problem. The fact that alcoholics have impaired utilization of the basic nutrients is unquestioned, but the level of deficiency is unique to each alcoholic. 3

In fact, these subclinical states may exist before active alcoholism because of poor nutrition. Furthermore, de facto nutritional deficits must exist in a subclinical state before they become clinically apparent. 4, 5

All chronic alcoholics suffer from some level of nutritional deficiencies. 5, 7, 10 The alcoholic obtains most, if not all, his/her daily energy requirements from ethanol, which although not a nutrient, contains approximately 7 calories per gram and represents about 3% to 5% of the daily energy intake of the adult American population. As the most widely abused drug of our society, ethanol contributes dramatically to the development of disease states of several organ systems, especially the liver 12 and gastrointestinal tract. 13 For many, the result is diminished utilization of oral nutrients that are necessary for normal health which leads to the subsequent state of malnutrition. 14, 15

Treating alcoholic malnutrition and end organ injury is a complex problem. Damage to vital organ function via the toxic effects of alcohol is just one of the many issues that need to be addressed. Absorption, assimilation, and elimination are all impaired to some degree. Unfortunately, the efficacy of intestinal absorption in a given patient cannot be predicted adequately. 3, 11 Inadequate diet, digestion, and malabsorption contribute to secondary malnutrition. 13, 16 Alcohol causes changes in protein digestion and metabolism, 91 absorption, metabolism, and utilization of vitamins, 52, 53 and deficiencies of minerals. 54

Lack of quality oral nutrition, impaired utilization of these nutrients, and excessive loss and reduced storage of these nutrients, all impede a return to mental and physical health and recovery. In fact, the central paradox in treating chronic alcoholism is getting enough nutrients into the alcoholic for organ repair so that the organ itself can utilize the nutrients in the most efficient manner possible. This is one reason that some treatment programs have begun to supply vital nutrients in much higher quantities to recovering alcoholics than one would supply a person in reasonably good health. 17 Nutritional supplementation and the correction of subclinical deficiencies are not only vital for improvement of general physiological health during detoxification and treatment, 18 but also
absolutely necessary for relapse prevention. Improving nutritional status is not only paramount in the detoxification stages and early treatment, it has also been shown, at least in the long-term, to decrease the over-all relapse rate.\textsuperscript{19,20}

Not only do nutritional deficiencies increase alcohol cravings, they also promote complications in alcoholics such as heart disease, liver disease, high blood pressure, diabetes, osteoporosis, and increased cancer risk.\textsuperscript{21} Additionally, the chronic use of alcohol has been shown to promote the development of depression.\textsuperscript{13,21-28} Nutritional therapies have been shown to not only reduce hepatotoxicity, reduce withdrawal syndromes and cravings, they also alleviate depression and anxiety.\textsuperscript{32,33}

Well-intentioned "nutritionally" based hospital diets have been shown to be less effective in treating alcoholism than whole food diets. In one such trial, coffee, junk food, dairy products, and peanut butter were replaced by a special diet which included fruit and a whole foods protocol. At the six-month review, fewer than 36% of those on the hospital diet had remained sober, compared to 81% of those eating the special diet.\textsuperscript{29} Other trials have shown that restricting sugar, increasing complex carbohydrates, and eliminating caffeine reduced alcohol cravings.\textsuperscript{30} When alcoholics are placed on diets high in raw foods, many spontaneously avoid alcohol (and tobacco); those placed on nutrient-loaded diets along with multivitamin supplements did far better at follow-up in abstaining from alcohol than did the controls.\textsuperscript{31} Unfortunately, research is limited involving nutritional treatment of alcoholism or drug addiction. However, in the well-planned nutritionally based programs that have been implemented, negative results are rare.

Joan Larson, director of Health Recovery Center and author of \textit{Seven Weeks to Sobriety}, has compiled astonishing statistics after designing a program that utilized nutrition as the foundation of alcoholic recovery. One hundred alcoholic clients, chosen at random, were followed up 3.5 years after completing the program. At discharge (7-weeks), 85% were free of anxiety, 94% claimed no sleep problems, 98% claimed no shakiness, 96% were free from dizziness, and 95% were subjectively depression-free. Furthermore, at the 6-month interview 92% were abstinent from alcohol, 85% of whom had remained continually abstinent since treatment. Some three years later, 95 of the original 100 subjects were interviewed and 74% had remained abstinent.\textsuperscript{17}

It has been known for some time that certain systemic problems, such as hypoglycemia, can cause an increase in the desire to use alcohol.\textsuperscript{34} In fact, it has been noted that almost all alcoholics suffer from some level of dysfunctional blood sugar regulation.\textsuperscript{35} This condition in itself increases alcohol cravings plus the desire to increase sugar intake. Control of blood sugar is paramount in recovery and has to be included in all levels of the treatment regime.

In the common type of 28-day treatment program where nutritional support is not the foundation of withdrawal and recovery, residual symptoms such as ongoing anxiety, insomnia, tremors and shakiness, dizziness, depression, and impaired cognitive function are not uncommon for up to 4-8 weeks after discharge.\textsuperscript{17,20} It is for this reason that we feel the current understanding of the mechanisms of withdrawal and detoxification, especially in treating alcoholism, must be redefined. Withdrawal encompasses more than just...
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clinical phases where the alcohol disappears from the human system. For example, it has been recognized, especially in opiate dependency, that the withdrawal syndrome does not end in 5-7 days. Subtle signs and symptoms existing past the currently accepted withdrawal phase, termed the "protracted withdrawal syndrome," may last up to six months. This is one of the reasons that maintenance programs such as methadone treatment, along with other psychotropics such as benzodiazepines, are utilized for extended periods of the opiate withdrawal. In comparison to alcohol, opiates by themselves may be one of the least toxic drugs on human physiologic functions and tissues while the long-term effects of alcohol on liver function, gastrointestinal function, and brain neurochemistry have been well documented. It is our position that the long-term effects of alcohol on organ system function contribute greatly to the high relapse rates among recovering alcoholics. Repair of affected organs requires a strong nutritional foundation during treatment and ongoing recovery. This primary focus on a "nutritional foundation" is lacking in almost all alcoholic treatment protocols at this time.

Every biochemical process at the mind-body level is controlled by genetics. We receive one set of genes from our mother and one set from our father at conception. We are the combination of genetics from these two people and also all of our past relatives. Certain expressions of gene function cannot be changed (our genotype), such as our eye color. However, we still carry enough genetic differences that we all function at the molecular level somewhat differently. Our phenotype, or how genes are expressed through environmental influences, is the most important consideration in the treatment of any chronic disease including alcoholism. Mutations of genes can cause variants of gene products. However, in one study, high vitamin therapy at least partly restored enzymatic function in 50 genetic diseases. Therefore, it is critical, especially in the nutritional treatment of alcoholism, that the clinician understands some basic concepts about genetics and biochemistry (i.e., functional/molecular medicine). Additionally, nutritional treatment of any disease requires some knowledge of nutrient absorption, distribution, metabolism and elimination.

All metabolic reactions (energy-requiring events) in biological systems require enzymes. Enzymes are proteins (the products of gene expression) that serve as catalysts to increase the rates of reactions without being destroyed in the process. As mentioned above, these metabolic events are changeable through environmental factors. The environmental factors that control the rate and extent of enzymatic reactions are: 1) The amount of substrate the enzyme has to act on. The basic substrates of biological systems are proteins, carbohydrates, and fats — the food we eat. At this level one must also consider the concentration of enzymes available to act on the substrate. Our genes largely determine the concentration of enzymes available for metabolic reactions but only if the amount of protein substrates is available for the production of enzymes. Enzymes can also break down products of enzymatic reactions (catabolic reactions). An example of this function involves the normally occurring enzyme monamine oxidase, which breaks down excessive serotonin or dopamine at the brain level. Monamine oxidase inhibitors are commonly used by psychiatrists to treat depression. In fact, at least half of the most commonly prescribed drugs in the United States act as inhibitors of enzymes; 2) Enzyme reactions vary in efficacy in relationship to temperature at which they are exposed. Higher temperatures typically increase while lower temperatures decrease velocity of these reactions; 3) Enzyme reactions are affected by the pH (acidity or alkalinity) of the environment. The pH optimum changes with different enzymes. For example, enzyme reactions in the stomach exist in a low pH (highly acidic) environment; 4) Cofactors, or coenzymes (vitamins, minerals, and some non-vitamins), are needed for most, if not all, metabolic enzyme activity. Furthermore, enzymes contain an active site that binds preferentially to the substrate with which it is to act upon. Once the product is generated, the enzyme dissociates and the product is available to provide its designed function. However, it's important to note that rarely is the product generated the final product. Therefore, the study of biochemistry requires following basic nutrients, and their conversion to products, through metabolic pathways. The product of one enzyme/substrate reaction is more often the substrate for the next reaction.

An example is the conversion of the protein tryptophan to the brain neurotransmitter serotonin. Low serotonin, as well as changes in the neurotransmitters dopamine and GABA, has been implicated in alcoholism and depression. Supplementing tryptophan is a commonly suggested treatment adjunct. Tryptophan, an essential amino acid (which cannot be synthesized in the body), is taken into the system through oral nutrition. Although tryptophan can be taken as a singular amino acid, it normally enters the body as part of a larger protein complex (polypeptides) which goes through enzymatic cleavage at the stomach, and later the small intestine, to yield the singular amino acid. It is then absorbed from the gastrointestinal tract and delivered to the liver for subsequent processing. These necessary events are commonly impaired in alcoholism. At least two products are generated and two enzyme-related events are needed before serotonin is formed at the brain level. Furthermore, the serotonin not utilized as a neurotransmitter is eventually utilized as a substrate to generate melatonin (necessary for good sleep among other activities). This conversion requires several more enzyme-related events. The essential coenzymes needed for these reactions are vitamin B-6, niacin, and magnesium. Genetic variants, substrate and cofactors concentration, and environmental factors can affect the quantity, or quality, of any molecule in any metabolic pathway.

As a side note, the clinician must be warned about supplementing higher doses of L-tryptophan. Tryptophan can be utilized in several metabolic pathways in the liver. Too much supplemental tryptophan can yield undesirable metabolic products and at high concentrations liver damage may occur. 5-Hydroxytryptophan (5-HTP), which bypasses liver processing, is sometimes utilized in the place of L-tryptophan to avoid this potential problem. However, at least theoretically, it must be noted that any nutrient supplementation in excess may have the potential to harm the client.

Nutritional therapy is a complex issue. Clinicians, who wish to pursue this level of treatment for their client, must understand extensive information on metabolism and genetic function. Without understanding the intricacy of molecular functions, and how they are activated and
manipulated through nutritional treatment, the clinician is more likely to create more harm than good. Even if harm is not caused to the client, treatment often fails to produce the desired result. Just taking one particular vitamin, or amino acid, to address health issues in detoxification and recovery is akin to supplying the client with just Prozac to "cure" their depression. Majid Ali, says it best: 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 central issue here is: Mononutrient therapy has no place in the clinical practice of molecular medicine. 

Nutrient therapies become complex because all nutrients that enter the human body have multiple functions. As an example, magnesium is involved in over 300 metabolic processes. It is essential for the production of ATP (a molecule which delivers energy for cellular processes) and for the synthesis of nucleic acids and proteins. In fact, magnesium is necessary for every major biological process. Magnesium deficiencies are common in alcoholism due to decreased intake, vomiting, diarrhea, and increased loss through urinary excretion. Another example of multiple coenzyme functions involves vitamin B-6. Vitamin B-6 is a coenzyme for over 100 enzyme-related events in the human body and is essential for the production of most major neurotransmitters including serotonin, dopamine, norepinephrine, and GABA. Vitamin B-6 is also necessary for production of nucleic acids, haemoglobin, and proper nerve function. It is a matter of fact that the absorption of all B-vitamins is affected by alcohol abuse. The level of deficiency varies, as was mentioned previously, from person to person.

Assessing nutrient deficiencies is difficult. Many times lab tests may show normal results even if specific levels are within defined parameters. As an example, only 1% of the magnesium in the human body is free in the blood and the rest is found in the cell or bone. In one lab study, involving alcoholic patients with low hemocrit, multiple nutrient deficiencies were noted. The researchers found that normal laboratory parameters, used for non-alcoholic patients, were inadequate when applied to alcoholic patients. This makes sense since nutrients have multiple and complex interactions at the cellular level and all alcoholics have varying degrees of deficiencies. Since all chronic alcoholics suffer from some level of nutrient deficiencies, then the best treatment protocols appear to involve designing balanced nutritional protocols, especially utilizing intravenous vitamins and minerals, which will assist the patient in recovery and detoxification. The goal with comprehensive IV nutritional therapy is to provide necessary nutritional support at the cellular level in the individual alcoholic whose gastrointestinal tract is compromised. Ultimately, this therapy will assist the individual back to a state of health so that oral nutrition will suffice in their ongoing health. Initial physical measurements such as body weight, height, and percent body fat would allow the clinician a point from which to measure therapeutic efficacy of the therapy.
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Treatment. A measurement of psychological parameters during treatment: whether subjective or objective, can also be used to measure therapeutic efficacy of the treatment protocol.

**Conclusion**

The successful treatment of the disease of alcoholism requires knowledge of cellular and biochemical events. Functional medicine recognizes that nutrition is the necessary cornerstone for all good health, which includes adequate detoxification and continued recovery in alcoholism. Through the utilization of nutritional therapy, the patient can be brought back to health quickly so that his body and mind functions can be utilized at the fullest extent. It has become apparent that mono-therapies, of any nature, have low success ratios in the treatment of alcoholism. It is time for health professionals of all disciplines to come together, with open minds, to utilize holistic treatment regimens that improve the success of treatment. In the few programs where this has occurred success ratios for continued recovery have risen dramatically.

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