Editors note: This article was written in 1987. It is presented as a classic yet timely article for today. Updates to tables 5 & 9 as well as new contact information has been included.

Immune Defense and Repair Systems in Biologic Medicine I: Clinical Relevance of Biological Response Modifiers in Autoimmunity

Diagnosis, Treatment, Tests and Interpretation

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"Man commands nature only by obeying her." **R. Bacon (1634)**

Health Restoration versus Health Maintenance in Syndromes of Chronic Immune Dysfunction

> **"...when (the) more benevolent (flora)...die off, they leave behind a literal wasteland of vacant tissue and organs. These sites, previously occupied with (healthy) bacteria, are now free to be colonized with new ones. Some of these new ones have caused serious and previously unrecognized diseases."**
> **Marc Lappé in** When Antibiotics Fail (1986)

INTRODUCTION

A common clinical assumption is that homeostatic mechanisms and immune defense and repair reserves are intact or can be spontaneously restored. This is not the case in autoimmune illnesses where homeostasis and immune defenses have been disrupted as marked by intracellular acidosis, impaired electron transport, and depletion of biochemical cofactors, often concurrently present. The causes and consequences for this are addressed in this article with emphasis on differential diagnosis and recent advances in laboratory testing.

Advances in molecular biology allow clinical information to be organized on the basis of molecular causes rather than symptomatic consequences. Organizing diagnosis by underlying biochemical or attitudinal disturbance with emphasis on functional capacity and functional tests provides earlier and more effective points of therapeutic entry. In clinical practice this proves to be more human-effective and cost-efficient. This is particularly valuable for chronic illness where multi-organ and control feedback disregulation is the rule rather than the exception.

Expression of chronic symptoms of autoimmune illness or serial infections and other signs of impaired host defense calls for therapeutic approaches that stimulate repair and enhance functional capacity of immune defense and repair responses. Such approaches for health restoration are more intensive than, and often qualitatively different from, those sufficient for maintenance of health.

The five elements of an immune-strengthening, health-restoring program include (Figure 1):

1. Reduction of Immunoreactive Load
2. Replacement of Cofactors
3. Reduction of Toxicants
4. Enhancement of Adaptive Skills
5. Enhancement of Immune Competence

Physiological chemistry of immune system response

The healthy animal is a carefully compartmentalized entity, each organ being carefully isolated from the vascular and lymphatic fluids and cells. When routine wear and tear is not repaired, the integrity of the extracellular scaffolding--the basement membranes of glycosolated, sugar-rich proteins, collagens, and elastins--is impaired, causing the diffusion barrier in blood and lymph vessel walls to enlarge up to 1000 fold from a healthy 50×10^3 Daltons (about the size of albumen) to 50×10^6 (about the size of macroglobulins).

Initially, this allows entry of larger plasma proteins with platelets and their vasoactive amines and mitogens, scavenger dendritic cells like macrophages, granulocytes and, when and as needed, lymphocytes with their cytokines. This can stimulate repair, if the cycle is self-limited, but can lead to autoimmune sensitization if the cycle persists because the energetic systems or essential factors do not respond to the repair stimuli. Persistence of repair deficits is promoted by anti-repair, anti-inflammatory cortisol hormones and chemicals of distress such as epinephrines, HCG, and insulin, and by intracellular metabolic acidosis.

Increase in blood-tissue permeability sets the stage for autoimmune illness. All autoimmune syndromes have a common denominator: immune system reaction against host tissues, usually restricted, but now rendered accessible to immune surveillance and reacted against as foreign. This inappropriate accessibility by one's immune system represents accumulated repair deficits and loss of homeostasis (1) in that particular system sometimes potentiated by an exogenous but cross-reactive antigen. Alternatively, this increased accessibility may reflect failure of self-tolerant mechanisms to suppress self-reactive cells due to up-regulation of immune responses and loss of feedback regulatory control. Repair deficit factors, which predispose to chronic disease or autoimmune states, can be classified as endogenous (biochemical and behavioral) or exogenous (environmental).

Biochemical factors include (see Table 2. **Primary Dispositions to Autoimmune States**):

1. **chronic deferral of necessary routine repair with consequent**
   a. **increased permeability of tissues;**
   b. **impaired tissue ionic selectivity often with loss of trace ions; and**
   c. **access to normally isolated tissue structures (become foreign and reactive)**[1].

2. **depletion of buffering reserve with consequent**
   a. **intracellular acidosis,**
   b. **⇑ in free (unbound) water in the cell,**
   c. **cell and tissue swelling; and**
   d. **impaired energetic and detoxification metabolism ("leaky cells").**

3. **metabolic uncoupling with consequent**
   a. **⇓ production and/or utilization of high energy compounds; and**
   b. **"bioelectrical short circuits".**

Environmental and behavioral conditions, which predispose to autoimmune states, and the three biochemical events listed above include (see Table 3. **Behavioral and Environmental Predispositions to Repair Deficits**):

1. **Immunologic overload from repeated foreign antigen exposure,**
2. **Depletion of antioxidant free-radical trapping agents,**

[1]. Often overlooked clinically, cell membrane permeability studies show it to be common.

3. **Mucosal permeability to lectins, digestive and microbial products,**
4. **Maldigestion with impaired assimilation of nutrients and waste elimination,**
5. **Unresolved distress, and,**
6. **Bioaccumulation of xenobiotic toxicants.**

Approaches to immune reconstitution of enhancement can be formulated by recognizing these interdependent elements and working concurrently to reduce, mitigate, or reverse them. We have learned a great deal about the interdependent and integrated ways in which the immune system defends and repairs us. We are also learning all too much about the myriad expressions of impaired immune function and performance (Table 1. **Autoimmune Syndromes and Associated Antigen Type**). While these conditions were essentially unheard of before the 1940s and are still exceedingly rare in indigenous cultures (2), they have become increasingly prominent with the last 30 years.

These immune responses reflect an "experiment" in which we participate by living in a rapidly restructured society (often without having signed an informed consent) affecting our food supply, our family relationships and our psychosocial expectations. This pace of adaptive change has accelerated in the last 40 years, a remarkably short time for biologic adaptation and learning of coping skills. This is the background fabric that displays the 20th century chronic autoimmune, inflammatory and degenerative illnesses, a background so familiar as to be forgotten or over-looked, especially as the symptomatic consequences present pressing acute problems.

As molecular biology discovers more of the immune system's methods of defense and repair, health can be defined in terms of resilience, endurance, and responsiveness; unbalanced excess or deficit of any compound can promote or potentiate disease and risk. To maintain health and to stimulate health restoration, we must use interventions that restore balance, stimulating repair by endogenous and homeostatic, feedback controlled production of hormones, neuroregulators, essential factors and adequate buffering capacity to maintain intra and extracellular pH.

The Integrated Immune System Responds to Integrated Biobehavioral Therapeutic Approaches

The immune system is an integrated, interdependent whole with finite limits. When immune responses are over stimulated or essential systems compromised by metabolic uncoupler toxins or essential factor deficits, repair is deferred, tissue permeability increases and the immune system can access and attack structural or cellular elements (see Table 1. **Autoimmune Syndromes and Associated Antigen Type**). When accompanied by reduced mineral stores, chronic intracellular acidosis and digestive remnants translocating across intestinal mucosa, impaired host defenses results in enhanced susceptibility to otherwise weak, opportunistic pathogens, from

parasites to viruses to other microbes (3-7). Therapies designed to enhance immune competence based on the recent advances outlines above include:

1. **oligoantigenic metabolically alkaline diets,**
2. **clinical tests of immune response,**
3. **cofactor replacement,**
4. **toxicant minimization,**
5. **therapeutic biofeedback,**
6. **phototherapy,**
7. **phytotherapy,**
8. **personal attitude,**
9. **support system, and**
10. **evoke the innate human healing response.**

The interactive use of these approaches forms a therapeutic whole where low risk and high gain approaches are emphasized.

1. Oligoantigenic Metabolically Alkaline Diets

> **"Clinical Sensitivity to one or more foods often originates from the degradation by-products of the foods and little or nothing is known of the precise chemical configuration of these breakdown products. Thus, skin tests with natural foods (not the breakdown products) is often less than reliable." Bernard A. Berman, past president, American College of Allergists, in** Coping with Food Allergy by Claude Frazier, 1985.

Aside from parenteral administration of vaccines and transfused blood products, the major route of entry for foreign antigens is the epithelial surface of the body, particularly the intestinal mucosa (8-10). In autoimmune syndromes, multiple deficits are more the rule than the exception (see Table 1. **Autoimmune Syndromes and Associated Antigen Type**) and contribute significantly to impaired host immune response. The list of conditions subsumed under the recent recognition of a common self-attacking, autoimmune origin as described in Table 1 below continues to grow and to cross all medical specialties. Our symptom-descriptive bias for categorizing disability obscured this common origin until recent molecular evidence enhanced the depth of our knowledge. This is also often the case for chronic viral syndromes (another aspect of impaired host cellular immune defense), from hepatitis and herpes to CMV, EBV, and retroviruses, including hose associated with ARC and AIDS. Increased intestinal permeability is now recognized in a wide variety of chronic inflammatory and autoimmune syndromes including

inflammatory bowel diseases (11-13, 18), celiac diseases (12-18), multiple sclerosis (10), eczema (19) and secondary to consumption of alcohol (20, 24-26) or medications such as aspirin or nonsteroidal anti-inflammatory drugs (NSAIDs) (27-29) and, perhaps, secondary to recurrent use of antibiotics (7), among others (see Table 4. **Increased Intestinal Permeability**).

Examining the pathophysiology involved, it is likely that increased permeability and enhanced foreign antigen load are common amplifiers and possible causes of chronic inflammatory and autoimmune syndromes (15-18, 21-24, 26-29). The hypothesis of "antigen excess" may also apply to immunologic overload-linked disposition to chronic infection, particularly persistent viral syndrome.

The antigenic load from foreign sources has long been recognized empirically as adversely affecting immune defense (30-33). Recently, the impact this may have on immune competence when the secretory IgA and local lymphoid capacity of the intestine are exceeded has been documented in molecular and clinical terms (31-35). Autoimmune conditions are more likely when secretory IgA capacity is routinely exceeded (35, 36). Clinical assay systems with adequate precision and predictive power are only now being developed and are not yet applied extensively.

In brief, the immune system is responsible for recognition and neutralization of foreign 'invaders'; for routine repair; and for intercellular communication maintaining physiologic rhythms (37, 38). When the foreign antigen load increases, chemical signals of alert are released. These include adrenergic monoamines, cortisols, insulin, ACTH, and kinins. The effect of these hormones is to defer repair while the immediate need imposed by the foreign antigens is attended.

When the frequency and intensity of these foreign signals increase, so much repair may be deferred that the host becomes increasingly susceptible to chronic inflammation. The stage is set for chronic inflammatory condition, the primary organ system affected is determined by the susceptibility imposed by the individual's life and style of living.

For example, it is possible to produce adult-type diabetes through autoimmune sensitization (39) and to modulate arthritis through similar mechanisms (40-42). Both these diverse clinical conditions are now recognized as variant expressions of autoimmunity (see Table 1. **Autoimmune Syndromes and Associated Antigen Type**).

One of the consequences of these hormonal and immunologic events in response to foreign antigen invasion is an increasing antigen provoked cellular and humoral response, lymphocyte and macrophage consumption, and acid load (43-46). When dietary consumption patterns provide insufficient buffering capacity, body buffering mineral pools can be depleted and the intracellular environment acidotic.

Accompanying this acidosis are:

A. Swelling and impaired function of mitochondrial electron transport,

B. ⇑ in intracellular free water;

C. ⇑ probability that membrane electrons become free-radicals,
D. ⇑ interstitial "third space" water particularly in the susceptible organ.

Free-radicals are physiologically produced electrons that escape normal electron traps either because of excess production or deficit of trapping anti-oxidants. These electrons attach themselves to reactive oxygen species and become superoxide anions, hydroxyl radicals, or singlet oxygen species, able to induce oxidant damage to membrane, cytosol, or nuclear components of the cell. Under normative conditions, electrons are efficiently shuttled by membrane tocopherol/selenium to cytosol ascorbate-glutathione-flavin and then into the energetic compound generating electron transport mitochrondrial system where polyphosphorylated nucleotides such as ATP and Phosphoenolpyruvate (PEP) are produced (42).

The electron transport of cytochrome (P450) system is also responsible for oxidizing toxic compounds to less toxic, more soluble products when conjugation occurs. With intracellular acidosis, this process of rendering toxic compounds biologically inert is retarded. Under certain conditions, the P450 system may generate more toxic compounds through epoxidation. Biologic detoxification is usually through coupling a sugar, such as glucuronic acid, or an amino acid, such as glycine, making the substance more water soluble and, thus, more easily excreted by the kidneys in urine or skin through sweat.

The remarkable capacity of the human organism to handle xenobiotic toxicants often gives rise to a false sense of unconcern about cumulative toxicant exposures. Nevertheless, this capacity is finite. Once detoxification systems capacities are exceeded, the organism's repair and defense capabilities can be severely impaired. The rapidly rising autoimmune syndromes, frequently linked to environmental toxicity and, perhaps, those associated with "sick-building syndrome" are examples of such phenomena.

Metabolic uncoupling and cellular inefficiency become more likely when lipophilic toxins or toxic minerals accumulate. Impaired protein synthesis, making tissue turnover less efficient, and slow loss of differentiated cells and structural protein scaffolding of the body are but a few of the adverse consequences. The four most important actions to reverse this cascade of events are:

A. Consumption of a metabolically alkaline diet,

B. Avoidance of foreign antigen load (dietary, environmental, & infectious),

C. Consumption of adequate intake of repair building blocks, and
D. An attitude that is consistent with these actions.

A metabolically alkaline diet means that the food has an alkalizing effect on the body chemistry. While the concept of acid of alkaline ash residue is the precursor to metabolic acidity of alkalinity, this can be different from the food's primary chemistry. For example, citrus fruits are alkalinizing because the metabolism of citric and other dicarboxylic acids generates more than twice as much bicarbonate as there is primary acid in the food. Table 5. **Food & chemical effects on acid/alkaline body chemical balance (updated)** includes most commonly consumed foods and the degree to which they acidify or alkalinize body chemistry.

We now know that immune responses directly and indirectly generate substantial amounts of acidic products. Thus, in the face of impaired buffering capacity, it is especially important to avoid as many sources of antigen-induced or other causes of acid formation as possible because of their adverse effects on cell metabolism.

2. Clinical Tests of Immune Function and Response.

Various clinical tests are currently in use for assessing an individual's adverse response to environmental antigens. Antibody assays can be performed, most easily for immunoglobulin G (IgG) (44-46). This has the advantage of examining the immunologic memory of the person. Antibodies capable of inciting a delayed response can be of the IgA, IgM, or IgG class as not all IgG antibodies induce symptomatic responses (44-46).

Four subclasses of IgG have been identified. These subclasses have different biologic functions and vary independently in different clinical conditions. This makes clinical interpretation of total IgG antibodies against specific antigens a challenge. IgG1 and IgG3 fix complement most efficiently through their binding to C1q and bind to granulocytes. Counterbalance to IgG1 and IgG3 may be provided by IgG2 in some circumstances. Only IgG4 is cytophilic for mast cells. Thus, some IgG antibodies may be protective and others are suggestive of clinically active adverse response (45, 46). Measurement of IgG antibodies omits information about IgA and IgM offenders and requires multiple subclass assays to provide the most accurate clinical information. Immune complexes can also be assayed through a variety of techniques, each with its own methodology limitations (47). Measurement of this and other aspects of cell mediated immunity can be particularly useful in immune complex disorders (see Table 1. **Autoimmune Syndromes and Associated Antigen Type**).

An ELISA modified test of cell mediated immunity (ELISA/ACT®) is available that is specific for all three delayed hypersensitivity pathways (humoral, immune complex and cellular by Gel and

Coombs classification) (6) or type 2 reactions (by Levin) (48). This allows for concurrent measurement of clinically significant humoral (IgA, IgG, and IgM), immune complex, and cellular causes of delayed hypersensitivity. This functional assay is unique in covering all hypersensitivity pathways allowing more true positive reactions to be identified. Table 6. **Clinical Test Systems of Allergy and Immunity** reviews the laboratory procedures for determining delayed hypersensitivity reactions. These are also shown in the "wheel of allergy" (Figure 2).

Removing many offending substances from the immunologic load at one time can set the stage for shifting from an adrenergic expectancy for attack to a cholinergic adaptive capacity. The substantial reduction in immunologic load plus alkalinizing foods can improve immune defense performance (49). The effects of partially digested foods on the immune system are summarized in Table 7.

Consequences of Maldigestion: Adverse Effects on Immune System Function From the Load of immunoreactive material Absorbed From Permeable Gut.

The consequences of this foreign invader load include:

A. Diminished host defense capacity

B. Deferred and reduced tissue and cell repair

C. Acid load from complement consumption + cell lysosomal activity

D. Stimulation and release of epinephrines, cortisol, and insulin

E. Loss of magnesium, zinc, and other minerals due to A-D above

F. Consumption of protective antioxidants due to A-D above

Since food additives (50), preservatives (51) as well as foods (44-48, 52) and other chemicals, including pharmaceuticals (53), can provoke hypersensitivity responses, it is useful to screen for as many substances as possible, in essence performing an 'immunologic finger print'. In the LRA by ELISA/ACT® system, 300 foods, preservatives, pharmaceuticals, environmental chemicals, and yeasts can be analyzed on a one ounce blood sample. (See Table 9. **Items assayable by LRA by ELISAACT (Updated)**). Additionally, for certain individuals, an easily assimilated predigested oligoantigenic diet one or two days per week or for short intervals to allow repair of intestinal integrity and to reduce intestinal permeability may be of benefit without the person sustaining a negative nitrogen balance and the attendant acidosis. Alternatively, parenteral nutrition may be necessary (54, 55).

Consumption of adequate intake of repair building blocks and the compounds that stimulate their use is addressed in the next section. Subsequent sections deal with mobilization of the information, insight and attitude that is consistent with these actions.

3. Cofactor Replacement

> **"A physician is obligated to consider more than a diseased organ, more even than the whole man-he must view the man in his world."**
> **Harvey Cushing, MD (1869-1939)**

Among the often hidden consequences of immunologic reactions is the depletion of essential nutrients due to the increased metabolic activity and acid reaction products that require buffering by renal excretory mechanisms. These acids are induced from increased consumption of coagulant, complement, and kinin related chemicals. These are consumed as the 'infantry' of the immunologic defense responses.

The three groups of compounds most often required are minerals, antioxidants, and essential fatty acids. The minerals are required to turn inert proenzymes into active biological catalysts (56,57). The intoxicants are needed to restore electron transport and to quench free-radical reactions as described in detail below (58). The essential fatty acids are required to build cell membranes (59).

First, some general comments are provided about the importance of establishing and maintaining a proper nutrient assimilation (60-64) and positive nitrogen balance and nutrient repletion in immunocompromised people (60, 65, 66).

Malabsorption and subsequent nutrient deficiencies stimulate glucocorticoid production. The resultant catabolism of muscle and lymphoid tissue provides abundant amino acids and energy for adaptation to the stressful situation, provided it does not last too long. Postulated physical and biochemical damage to the gastrointestinal tract by enteric pathogens might preclude successful dietary therapy with natural foodstuffs. Elemental diets do not require digestion (but do require absorption, if given orally) and do not contain possibly antigenic protein fragments found in partial protein hydrolysates as well as whole foods incompletely digested. The glucose present in elemental diets should be readily absorbed and metabolized as an energy source. In animals, feeding of a 15% glucose solution abolished the test animal's response to glucocorticoids in 12 hours, probably by elevation of tissue cyclic GMP (an antagonist to cyclic AMP) (67).

Concern about the acidosis linked to glucose metabolism in mineral depleted hosts can be tempered by the recent availability of an evaporated whole cane juice that contains a full mineral complement (as 3-4% of total solids) with adequate chromium, manganese, vanadium, magnesium, and potassium to facilitate metabolism. This is suitable to oral administration in most people with

nutrient assimilation blocks. We regularly use liquid nutrient diets one or tow days a week in subjects who need to repair intestinal digestions and assimilation defects without the cost of ketosis and negative nitrogen balance which ma enhance viral activity. For some subjects, oral or intravenous hyperalimentation is essential in restoring intestinal integrity so that adequate nutrient assimilation can take place or in providing higher tissue levels of substances than can be accomplished through the oral route. A typical course is thirty days, although fourteen may be sufficient and at time forty-five or more days may be required.

The adrenocortical stimulation elicited by stress conditions but not under basal conditions in animals was significantly enhanced by high protein diets (68). If this observation is applicable to humans, one interpretation would be that in a stress state, high protein diets accentuate adrenal responses, have acid residue from their metabolism, enhance degradation of structural proteins and should be avoided in AIDS patients or others with immunologic impairment, autoimmune conditions, or other chronic viral states.

Protein consumption of 60±20 grams daily results in sufficient protein for tissue replacement and repair without the untoward consequences of excess protein consumption (>100 grams daily). High protein, high fat diet composition is surprisingly common, particularly in people who develop chronic viral syndromes or autoimmune conditions.

Moderately low protein diets with adequate calories enhance growth hormone production. In animals, growth hormone administration completely abolished susceptibility to opportunistic infections cause by exogenous ACTH or cortisol excess (69).

Diets of this sort increase production of somatotropic, growth promoting hormones. Selye first described the protective effects of somatotropic hormone against the catabolic effects and susceptibility to infection caused by cortisol excess (69). Some have hypothesized that rebound from immunological depression can be attributed to sustained elevation in growth hormone and thyroid hormones which enhance lymphocyte proliferation (70).

Growth hormone (HGH) and growth hormone homologues are obligatory factors in recovery of immune function following distress and they directly antagonize the lymphocyte effects of corticosteroids. Since moderate protein diets such as those recommended increase HGH release, this may be a simple, indirect way of elevating HGH levels, and perhaps other anabolic factors as well.

Recommending vigorous nutritional therapy to avoid the catabolic effects of negative nitrogen balance while avoiding high protein diets for subjects under stressful conditions generally is most easily accomplished from a whole food diet with 55% complex carbohydrate, 20% protein, and 25% fat (particularly monounsaturated oils and essential fatty acids). This is particularly important for people with significantly disordered digestive microbial ecology (from colonization with

fermentative yeasts, pathogenic microbes, and other parasites) who are subjected to elevated levels of vasoactive, neuroactive, immunosuppressive and antigenic polypeptide fragments because of impaired protein digestion and increased mucosal membrane permeability.

Mineral status can be determined through tissue mineral analysis (66, 71,72). Alternatively, therapeutic trials of dietary sources rich in minerals can be utilized.

Antioxidant deficiencies can be determined by microbiologic or enzymatic assays (72, 73). The phosphatides containing choline and ethanolamine are important in maintaining cell membrane fluidity. A more fluid membrane is more easily deformable, more resilient to circulating forces, more able to internalize absorbed antigens for lysosomal destruction and more resistant to viral binding and replication (59). Table 8. **Nutrient Cofactors: Replacement Links to Improved Immune Function** lists the minerals, antioxidants, and phosphatides most often needed. It is increasingly recognized that clinical needs may not be revealed by routine serum tests of, for example, cobalamin (74) or minerals (75).

A. MINERALS

A variety of minerals are important in maintaining immunologic integrity. Zinc and magnesium are particularly well studied example, especially as they relate to AIDS. Zinc deficiency reproduces many of the laboratory and clinical findings in AIDS including depressed cellular immunity, particularly T4 function, killer T cell function, thymic involution (76) and increased susceptibility to fungal and viral infections. Essential factor supplements, such as zinc, in aged patients is reported to improve immune responses in three respects:

1. ⇑numbers of circulating lymphocytes,
2. Intracutaneous delayed hypersensitivity reactions, and,
3. ⇑ specific antibody (IgG) production in response to injected antigens (77).

Another common problem in autoimmune and immunodeficiency patients is colonization by enteric fungi which elaborate immunosuppressive compounds like cyclosporin whose effects have been proposed as a potentiating factor in AIDS (78). Zinc administration is suggested as a logical therapy for this problem since it both inhibits the production of gliotoxin in fungal cultures (79) and offers significant protection against formed mycotoxins (80, 81).

Yet another symptom frequently seen in AIDS patients, chronic diarrhea of unexplained etiology, may be secondary to zinc deficiency.

Measurements of zinc status are often unreliable indicators of clinical status (82), thus a therapeutic trial of physiological amounts of zinc in the presence of the zinc-binding ligand polyconic acid (83) is one approach to determine its deficit status and clinical efficacy.

Other important minerals (Table 8. **Nutrient Cofactors: Replacement Links to Improved Immune Function**) include: magnesium, copper, iron, selenium, molybdenum, manganese, vanadium, and boron (84-86). Effective therapy requires pure, easily transported, biologically active and properly balanced forms. The Krebs cycle intermediates (citrate, fumarate, and malate), ascorbate, and possibly picolinate, fill these requirements. Clinical determination of mineral status can be performed using a provocative method (See Figure 6).

B. ANTIOXIDANTS

Among the antioxidants, tocopherol, ascorbate, glutathione, polyphenolic flavanoids, and cytochromes are most important. Bioflavonoids, particularly quercetin dihydrate, soluble OPC and possibly others work synergistically to spare antioxidant consumption. In conditions of active viral replication, continuous therapeutic amounts of antioxidants for thirty or more consecutive days may be essential to minimize viral control of cell machinery. For those who can, hourly consumption of ascorbate at tissue saturation levels is essential. For some, parenteral administration may be necessary to allow restoration of mucosal assimilation and to saturate tissue sites such as brain and bone marrow (87).

Let us look first at Vitamin C as a representative antioxidant. The appropriate use of vitamin C supplementation in health and disease depends upon an accurate understanding of the relevant facts (88-90). A few encouraging clinical observation applying what is described below have been made in AIDS and ARC (91,92,95).

Almost all animals and plants synthesize their own vitamin C. Notable exceptions are guinea pigs, monkeys and humans. The first two those species eat fresh vitamin C-rich foods: fruits and vegetation. Animals, when adjusted for size and weight to human standards, manufacture the equivalent of 5 to 15 grams of vitamin C per day (mostly in their livers) when stress free. Production can increase more than ten-fold when the animal is distressed (89, 93).

Our genetic ancestors once had the ability to synthesize vitamin C but lost it (millions of years ago). One enzyme is missing in a 6 enzyme sequence that converts glucose to ascorbate. Scientists estimate that without this mutation we would be making 10-30 grams of ascorbate a day in order to meet basal repair needs (93-95).

Our livers would be making ascorbate steadily, with increases commensurate with stress load, if we had not lost that key enzyme. Thus for best health, is important to take ascorbate regularly and steadily. In chronic viral states consumption may be so rapid that hourly doses are needed to maintain tissue saturation. We suggest a minimum of 4 times per day with more serious problems requiring more frequent dosage schedules, starting at approximately 1/4 teaspoon every other dose, usually to no more than 1-2 teaspoons per dose.

It is of great interest that cure of infections with the feline leukemia virus--a retrovirus of the same class as HIV1--with ascorbate plus other nutrients has been reported (96).

Glucose and ascorbate are similar structurally and it may be that some sugar craving represents s need for vitamin C. Taking ascorbate if often more helpful for those craving when they occur.

Ascorbate has a myriad of important functions within an organism and within a cell. Dozens of important functions of ascorbate relate to cell repair and division, energy production and antioxidant effects which render toxins water soluble and inert.

Many of us eat small amounts of ascorbate-rich foods. Also, our food supply contains less and less active vitamin C and more oxidized forms which are anti-ascorbate (such as diketogulonic acid) because of premature food harvesting, artificial ripening and food processing/storage techniques.

Vitamin C, reduced and crystallized in its native state free of oxidized forms or contaminants has virtually no adverse side effects. It has been given up to 300 grams per day, orally and intravenously, without complications (90-92, 97-99).

Vitamin C in large doses is probably the most effective, lowest risk general antiviral agent that exists (90, 98-101). We especially recommend it in cases of chronic viral illness, including hepatitis (90, 102-105), mononucleosis with persisting fatigue, EBV, CMV, HIV (92, 106), syndromes like SLE (Lupus) and other autoimmune states such as Sjogren's (rheumatoid) syndrome. Ascorbate is also beneficial against certain intestinal pathogens (107). Recent work by Jarawhalla suggests a direct anti-HIV effect of therapeutic concentrations of ascorbate. These cell culture studies are based on quenching reverse transcriptase, a direct index of retroviral activity (Personal communication).

In addition, ascorbate, taken at tissue saturation levels, strengthens immune system functioning (108). We ask people to take vitamin C in the mixed Ascorbate Buffered Mineral form rather than the Ascorbic Acid form. The neutral pH of the salts is preferable to the acidic form and much better tolerated in large doses, and also serves as a source for supplemental calcium, magnesium, potassium and zinc.

It is recommended that people take ascorbate salts to tissue saturation, which means the amount which saturates absorption, just below that amount per dose that results in gas, cramps, and/or diarrhea. This gastrointestinal "upset" represents saturation of the absorptive tissues so that no more ascorbate can be assimilated at that given moment. Increased peristalsis moves digestion products through the gut more quickly. Improvements in gut bacteria quality are often accompanied by transient flatulence (gas). This is not harmful although it may be uncomfortable.

Often gas, cramps and diarrhea occur at rather low doses of ascorbate (below 10 grams). There exist many possibilities for this, such as, the body being to depleted that:

1. **The ascorbate strengthens previously atonic intestinal motility,**
2. **A Herxheimer reaction occurs from die off of harmful organisms in the gut,**
3. **There exists a deficiency of two elements that aid ascorbate uptake and metabolism:**
    a. **L-Glutathione, reduced form (take 1% of ascorbate intake)**
    b. **Bioflavinoids, as quercetin/pycnogenol (take 5% of ascorbate intake).**

This means 0.1 gram (100 mg.) of reduced L-Glutathione and 0.5 grams (500 mg.) of quercetin/pycnogenol are required for each 10 grams of ascorbate ingested.

Pushing ascorbate to tissue saturation is important. Many helpful things happen at the saturation level that will not happen otherwise. The benefits of tissue saturation intake of ascorbate has been emphasized (92, 95). The important benefits of maintaining tissue saturation absorption can hardly be overemphasized.

Appropriate doses of ascorbate and other antioxidants are an effective way of charging up the cellular electron pool, promoting cellular healing and metabolism, purging the body of foreign invaders and providing a base on which to build health.

Over a period of ascorbate use, people find the amount of ascorbate to achieve tissue saturation changes, during stress or illness, many times more are needed because of increased cellular consumption than at other times. As health improves, tissue saturation levels decrease (90-95).

Other antioxidants are also important.. For example, tocopherol reduces oxidant and free-radical damage to cell membranes thus reducing cell turnover (91-96). Glutathione, flavins (such as riboflavin), and cytochromes (such as coenzyme Q) help maintain the electron shuttle, which produces high energy compounds for the cell. Quercetin reduces basophil degranulation (109, 110), histamine release (111-113), and dampens the inflammatory response directly by modulating certain key enzymes including lipoxygenase, phospholipases, and nucleotide diesterases (112-115).

The allyl sulfides of garlic, onions, and ginger may also be useful (115-117). Table 8. **Nutrient Cofactors: Replacement Links to Improved Immune Function** identifies mineral, antioxidants, and lipids, which can be beneficial.

C. PHOSPHATIDES

Phosphatides are increasingly recognized as important for membrane integrity (72, 120). Phosphatidylcholine and phosphatidylethanolamine have received the most attention as possible therapeutic agents (72,121,122).

Repopulation of intestinal flora using mixed organism cultures, preferable grown in log phase to maintain the highest proportion of viable organisms, can be important to enhancing digestion and assimilation of nutrients, especially in food maldigestion associated hypersensitivity conditions, including asthma and those linked to preservatives (118, 119).

4. Toxicant Metabolism

"The specific disease doctrine is the grand refuge of weak, uncultured, unstable minds... There are no specific diseases; there are specific disease conditions." Florence Nightingale in Notes on Nursing

Avoidance of potentially toxic substances, especially those which impair immune function, is part of the process of health enhancement. For many people, commonly encountered substances need be appreciated for their strong biologic effects, adverse to the impaired immune system (123-129) and what can be done to avoid or mitigate these insults (90,92,130-132). These substances include:

1. caffeine-containing substances (e.g. coffee, black tea, cocoa, and colas)
2. nicotine-containing substances (tobacco in all forms)
3. alcohol above modest amounts (>2 ounces per day)
4. nitrates (especially the butylated compounds used a recreational drugs)
5. amphetamines
6. barbiturates
7. narcotics
8. phencyclidine (PCP)
9. pesticide residues

10. solvents (from recreational drug, occupational, or hobby exposure), and

11. heavy metals, (e.g. lead, mercury, arsenic, cadmium, nickel, and aluminum)

Both the use of and the attraction of the individual to these compounds are important and useful sources of information in the process of improving immune system and overall health. It is important that the attraction tot he harmful compound be identified and appreciated.

Low temperature saunas can be useful in lowering the body's burden of lipophilic toxins (Figure 3) (130, 131). Provocative testing for tissue mineral, including toxic metals, is useful in determining the role nutritive and toxic metals play in disposing to chronic disease (Figure 4) (132). Heavy metals are particularly important because they can compete, often preferentially, with other minerals for the active site of metalloenzymes resulting in inhibition of the enzyme activity as occurs with mitochondrial metabolic uncoupling.

5. Therapeutic Biofeedback

We are learning animals. Our associations (the amount of positive or adverse situation perceived) with experience (consumption of a food or other contact) color the effect on our immune defense and repair systems. The contingent link of associations with experience--perhaps particularly the first experience--is such that on each subsequent consumption the effect of the experience is repeated and reinforced. Under laboratory control, animal models have shown the capacity to adversely (134-136) or favorably (137, 138) influence immune competence. We are also learning how to disconnect these reinforcing linkages.

When adverse experience becomes state bound with consumption of foods, adverse effects on the immune system can ensue (138-141). Properly applied therapeutic biofeedback can reset the body response mechanisms (142). This can be particularly useful in reversing the links to environmental exposures, including food and chemicals, especially when the offending substances have been accurately identified (143). An added dimension is the increasing recognition of the link between food consumption (*e.g.,* carbohydrates) and neurotransmitters (*e.g.,* serotonin) (143-146).

Therapeutic biofeedback can be a useful aspect of stimulating the intrinsic repair mechanisms of the body and resetting learned distress patterns both in animal models (147-149) and in human subjects (150-152) contingently associated with foods or other experiences.

6. Phototherapy

> **"With the highly technical knowledge and skills needed to affect the patient's physiologic functions there should also be a feeling of humanness, a sense of confidence and security based upon the conviction that all will be done that can be done. Such an atmosphere will allow a wholesome personal relationship to develop. The patient must be allowed to feel that his or her**

unique individuality is recognized and that life's problems are appreciated."
Harrison's Textbook of Medicine, 9th Edition, page 2.

The importance of the skin in immunology has recently been recognized (153, 154). The use of sunlight is known to enhance activation of 1,25 DiOH-cholecalciferol (active vitamin D3), an important immune modulator and calcium regulator (155); to enhance maturation of B lymphocytes (153, 154); and to stimulate connective tissue synthesis (153, 156). Thirty to sixty minutes of sun daily, preferably on the full body, gives optimum effects clinically. The interaction between antioxidants such as beta-carotene and sunlight exposure has received attention (157, 158).

We find dichromatic lights, particularly green in color, helpful when sunlight is unavailable. Used as described in Figure 5, twenty minutes two to three times daily gives best clinical results. Among the beneficial effects observed are substantial reduction in galvanic skin response (GSR), a general index of autonomic, adrenergic arousal, after 15-20 minutes use (159).

The effect of light on free-radical formation in skin has been studied (160). The beneficial effects of increased illumination on calcium absorption is reported (161). Others find enhanced illumination helpful in seasonal affective disorders (SAD) (162).

More is not necessarily better (163) and classic wisdom teaches the importance of balance of sunlight and nutrient availability (164-166). Light, as radiant energy of particular frequencies does entrain the brain through non-visual pathways (164-166) and influences endocrine biological rhythms (164-168).

7. Phytotherapy

"Nature's ever open book...come to us, page by page, word by word, and letter by letter, in the form of living human beings that are technically called patients." Dr. J. Compton Burnett in Diseases of the Veins.

The informed use of biologically active plant substances is giving new impetus to pharmacognosy: the study of natural products therapeutic efficacy (169, 170). Application of modern bioassay techniques make possible establishment of standardized, consistent, active therapeutic preparations. The lack of standardized, assayable preparations was a major limitation until the recent application of high technology sampling and preservation techniques married traditional experience (171-173). The best documented immunomodulator natural products include:

1. Echinacea (*Echinacea angustifolia*) whose constituents include glycosides, polysaccharides, and polyacetylenes (which may be particularly important for biological activity) with actions including production of interferons and active lymphokines, and antiviral activity (171-173),

2. Goldenseal Root (*Hydrastis canadensis radix*) whose berberine and other alkaloids show antifungal activity against Candida species (174) and antiprotozoal activity against Giardia Lamblia (175-176),
3. Licorice Root (*Glycyrrhiza glabra radix*) whose actions include interferon stimulation (177) and thymic stimulation due to anti-cortisol effects (178),
4. Mistletoe (*Visicum album*) which stimulates cortical lymphocytes of the thymus, perhaps from its lectins and polysaccharides (179, 180), and,
5. Shitaake Mushroom (*Lentinus edodes*) whose acetylene and lentinen polysaccharide compounds stimulate interferon (191), enhance macrophage phagocytosis (182), enhance T lymphocyte transformation (183), and activate the alternate complement pathway (184).

Other promising agents include:

1. Wormwood (*Artemesia annua*) (185, 186) whose artemisinin has activity against malaria and perhaps other protozoa,
2. Astragalus Root (*Astragalus mongholicus or Hoantchy radix*) which enhances phagocytosis by macrophages, reticuloendothelial cells and interferon production (187, 188),
3. Barberry Bark (*Berberis vulgaris cortex*) another rich source of berberine alkaloids with antifungal and antiprotozoal activity (189) and anti-pyretic action (190, 191),
4. Burdock Root (*Arctium lappa radix)* whose insulin polysaccharides stimulate phagocytosis (192) and show anti-mutagenic action in cell culture (192), and,
5. St. John's Wort (*Hypericum triquetrifolium turra*) which contains hypericin and pseudohypericin, both of which show anti-retroviral activity in cell cultures (169).

The area of botanical natural products chemistry is in active development with the application of modern and traditional technologies to clinical syndromes of immune dysfunction. Clinicians should expect the agents to be processed under conditions, which preserve activity and to have bioassays available from their supplier. In addition, agents should be certified free of contaminants including pesticides, fungicide, and fumigant residue; heavy metals; and degradation compounds which might interfere with the active agents.

8. Personal Attitude

"...you can change your mood by changing how you think. There is a second major approach to mood elevation that is enormously effective. People are not only thinkers, they are doers, so it is not surprising that you can substantially change the way you feel by changing the way you act. There's only one hitch--when you're depressed, you don't feel like doing much." David Burns, MD, in Feeling Good, Signet, 1980, p75.

The attitude and mood of the person serves as an amplifier of all other actions taken. Following the health enhancement steps above gives positive feedback that affirmative steps are being taken (203). This creates a window of opportunity through which internal conflicts, ambivalences, and problems of self image can be addressed (203-205).

Many studies have shown the important benefit to immune defense and repair of a well grounded hopefulness (206). A note of caution: there have been attempts to reduce to a mechanical process or to impose upon people an external pattern of thinking. This can have short term apparent benefits, but in our experience over years, it is the active process of therapeutic biofeedback, or a suitable active visualization, or the use of guided imagery and music that have effected enduring beneficial changes (205-210).

9. Support System

> **"...what is most important, it is also you who will make the choices in the future. Whatever you did in the past, you did for the best reasons you knew at the time. But today, you have more alternatives to choose from. And tomorrow, you'll have even more. There's no reason why you have to repeat your choices of the past--unless they proved to be the best for you."**
> **Harry Browne in** How I Found Freedom in an Unfree World.

The use of a regular support group of peers is a most valuable component of evoking the sustained human healing response. Affiliating with a group of like-minded people to discuss concerns, focus on issues, have sounding boards for problems of living, and be available as concerns surface is most valuable. We especially recommend that people have someone within their support system to whom they reach out immediately upon the awareness of concern, doubt, fear, anxiety, or similar emotion so that the issue can be dealt with promptly ("while the fish is still flopping") and so that the cost to immune defense and repair systems can be minimized. It is often a new experience for people to realize that they can be helpful to some other individual simply for the sake of being helpful and that the other person is similarly available to them.

Various research studies support this approach and document the importance of such a perspective (211-216). The field of psychoneuroimmunology is rapidly emerging and several useful reviews exist (215-219).

10. The Human Healing Response

> **"...create a balanced perspective, one that recognizes that attitudes such as a strong will to live, high purpose, a capacity for festivity, and a reasonable degree of confidence are not an alternative to competent medical attention but a way of enhancing the environment of treatment... (the) physician's communication skills need no longer be regarded as theoretical**

assets. The wise physician favors a spirit of responsible participation by the patients in a total strategy of medical care." Norman Cousins, JAMA, 15 Sept. 1988

The above ten sections provide one systematic approach to enhancing immune defense and repair systems. The above suggestions employ caring and competent, helpful and hopeful, grounded and reasoned, informed and inspired perspective.

The capacity of the human organism to respond to opportunity, given the correct biochemical, perceptual, and emotional support systems is most remarkable. While often overlooked as the placebo effect, we prefer to recognize this capability as the human healing response (220-228). Various studies and reviews can provide background insight into which of these approaches is best suited to an individual (229-238). In particular, active meditation can have beneficial physiologic effects.

The Clinical Value of Practical Eclecticism

"Science...must describe and accept the 'way things are', the actual world as it is, understandable or not, meaningful or not, explainable or not."
Abraham Maslow in Towards a Psychology of Science.

The challenge of autoimmune syndromes and chronic debilitation viral states leads to new insights into applied biochemistry and to a humble recognition that many approaches from unfamiliar paradigms or belief systems may be used with success on these dilemmas of our time.

We have built a working model that is eclectic, drawing upon what works from empiric, observational science. This crosses many disciplines, drawing what works from each and weaving them into a compatible whole. A practical understanding of bioelectrical chemistry and immunology translated through a caring and competent health coach brings this approach to life. People are individuals and benefit from adequate explanation so that they are active participants in the process of implementing this program and evoking the maximum healing response possible.

In the past two generations, autoimmune syndromes such as Lupus, Thyroiditis, Sjogren's Syndrome, Glomerulonephritis, inflammatory bowel disease (IBD), late-phase asthma, adult diabetes, and immunopathies have increased four (4) to twenty (20) fold. While this is true in North American and Europe, this is not true in indigenous societies. Even when corrected for improved diagnostic techniques across cultures and over time, the 300% to 2000+% increases in these syndromes stand testimony to the shifting patterns of disease associated with life in post-industrial society.

Discussion

> **"Modern medicine will become really scientific only when physicians and their patients have learned to manage the forces of the body and the mind that operate in vis medicatrix naturae." Rene Dubos in the introduction to Norman Cousins'** Anatomy of an Illness

The immune system is our repair, defense, and communication system. All specific functions depend upon this interactive surveillance system. Restoration of immune competence depends upon identification of elements in the biochemistry and perception of the person that need strengthening and avoidance of those elements, which diminish immune competence. More easily said than done, the above is a guide. The emphasis given here is on practical distinctions, which distinguish what works from what merely glitters, much the way a gemologist distinguishes gold from pyrites. The patient benefits when the art and science of *vis medicatrix natura* are appreciated and applied with an emphasis on the lowest risk/highest gain approaches available, setting aside all considerations other than the person's full welfare.

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About the Author

Dr. Russell Jaffe received is AB, MD (with Senior Thesis Honors), and Ph.D, (In Biochemistry and Physiology) from Boston University, all in May 1972. Dr. Jaffe served his medical internship at University Hospital and joined the United States Public Health Service, being assigned to the Clinical Center of the National Institutes of Health, in June 1973. While at the Clinical Center, Dr. Jaffe served his residency in Clinical Pathology. He is board certified in Clinical and subspecialty certified in Chemical Pathology. Dr. Jaffe remained on the permanent senior staff of the NIH Clinical Pathology Department where he continued method innovation and did collaborative research with the Laboratory of Experimental Atherosclerosis (of the Heart, Lung, and Blood Institute).

Concurrently, Dr. Jaffe's interested in the mechanisms of health and the evoking of the human healing response led him to apprentice in the cultural systems of various cultures, including such healing arts as acupuncture, meditation, and a variety of related therapeutic approaches.

In addition, Dr. Jaffe did innovative studies of platelet and other blood cell biochemistry and metabolism. Among the tests he developed are the early colon cancer-screening test using occult blood detection not interfered with by vitamin C consumption and a variety of tests related to the blood clotting and immune defense systems. Dr. Jaffe developed the first method of measuring cell-mediated immunity using a modified ELISA system in a lymphocyte blastogenesis brief cell culture. This LRA by ELISA/ACT® provides an "immunologic fingerprint".

Dr. Jaffe has contributed over 40 scientific articles or book chapters. Dr. Jaffe has been invited to lecture in Europe, South America, Canada, Mexico, and many states of the nation. Dr. Jaffe received the J.D. Lane award for original research from the USPHS, the Merck Sharp and Dohme Excellence in Research Award, and various recognitions for his investigations.

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Table 1. Autoimmune Syndromes and Associated Antigen Type

Antigens Specific to Host Components[a]

Clinical Disorder	A	B	C	D	E	F
Lupus Erythematosus	+		+		+	
Sjogren's Syndrome	+				+	
Polymyositis	+		+			
Hepatitis, Chronic Active	+				+	
Connective Tissue Diseases	+					
Diabetes, Insulin Dependent	+	+				+
Pernicious Anemia	+					+
Biliary Cirrhosis, Primary	+					
Thyroiditis	+	+				+
Addison's Syndrome	+					
Vitiligo	+					
Enteropathy, Antigens[2]	+					
Hyperthyroidism (Graves)	+	+				
AIDS/ARC	+		+			+
Myasthenia Gravis		+				
Hemolytic Anemia			+			
Neutropenia		+				
Thrombocytopenia (ITP)			+			
Rheumatoid Arthritis			+		+	
Multiple Sclerosis			+			
Pemphigus vulgaris			+	+		
Infertility (Autoimmune)			+			
Glomerulonephritis				+		
Discoid Lupus			+			
Dense Deposit Disease					+	
Adult Diabetes	+	+	+			
Sjogren's Syndrome	+	+			+	
Pneumonitis/Bronchitis (allergic)			+	+		
Asthma		+		+	+	

a. Antigen site in cell or tissue:
A = Intracellular; B = Receptor; C = Membrane; D = Extracellular; E = Plasma Protein; F = Hormone.

2. Classically, gluten has been implicated in inflammatory bowel diseases (IBD) but an increasingly wide range of digestive antigens are now recognized as sources of mucosal inflammation and host sensitization with potential immunologic overload.

Table 2. Primary Dispositions to Autoimmune States

Molecular Event	**Consequence**
Loss of Extracellular Connective Tissue Matrix	"Breaching of Tissue Barriers" •Increased permeability of tissues •Access of antigenic materials •Altered ionic selectivity
Depletion of Intracellular Buffering Capacity	"Leaky Cells" •Organic acids from immune reactions •Intracellular acidosis •Increased free (unbound) water •Cell swelling •Impaired metabolism
Metabolic Uncoupling	"Bioelectric Short Circuits" •Inefficient electron transport •Decreased production of high energy compounds (ATP, PEP) •Inefficient utilization of high energy compounds

Table 3. Behavioral and Environmental Predispositions to Repair Deficits

1. Persistent Immunologic Load from Foreign Antigens
    - •infectious agents, especially via epithelial and mucosal surface:
        - bacteria
        - protozoa
        - viruses
        - spirochetes
        - parasites
    - •environmental antigens:
        - digestive remnants
        - aerosols
        - topical contacts

2. Depletion of Free-Radical Trapping Agents
    - •membrane components such as:
        - tocopherols
        - selenium
        - prostaglandin precursor essential fatty acids
        - choline and ethanolamine phosphatides
        - glycerides
    - •cytoplasmic elements:
        - ascorbate
        - glutathione
        - flavins
        - thiamines
        - cytochromes
    - •magnesium, zinc, and other mineral metaloenzymes:
        - manganese
        - molybdenum
        - vanadium
        - boron
        - copper
        - iron

3. Unresolved Distress
    - •persistent production of:
        - cortisol
        - insulin
        - epinephrines

other anti-inflammatory compounds
- over-stimulation of endocrine glands such as thyroid and adrenal
- dysregulation of:
  - temperature
  - glucose
  - glycerides
  - pH
  - muscle tone

4. Maldigestion/Malnutrition
   - Insufficient consumption of necessary building blocks
   - consumption not broken down to building blocks
   - antigenic remnants in intestine cause:
     - local inflammation
     - depletion of secretory IgA
     - Peyer's patch (Gut associated lymphoid tissue, GALT) activation of B lymphocytes, immunologic load
   - intestinal muscle irritability
   - impaired transit time
   - reabsorption of toxicants such as:
     - polyamines
     - bile acids
     - other toxicants

5. Bioaccumulation of Xenobiotic Toxicants
   - heavy metal metabolic uncouplers such as:
     - lead
     - mercury
     - arsenic
     - cadmium
     - aluminum
     - nickel
   - non-biodegradable metabolic uncouplers such as:
     - polyhalogenated heterocyclics, pesticides and PCBs/PBBs
   - enzyme inhibitors such as cholinesterase inhibitors
   - membrane fluidity interferences:
     - solvent residues
     - trans-fatty acids

Table 4. Increased Intestinal Permeability

Conditions Associated	Antigens/Agents Associated
Coeliac Enteropathy	-gluten
Crohn's Disease	-casein & dairy exorphins
Other IBD	-varies with individual
Alcohol consumption	-alcohol
Drug Effects	-NSAIDs, ? ASA
? Autoimmune Syndromes	-varies with individual
? Multiple Sclerosis	-Endotoxin + Antigen(s)

Table 5. Food & chemical effects on acid/alkaline body chemical balance (Updated)

Food & Chemical Effects on Acid / Alkaline Body Chemical Balance™

Most Alkaline	More Alkaline	Low Alkaline	Lowest Alkaline	Food Category	Lowest Acid	Low Acid	More Acid	Most Acid
Baking Soda	Spices/Cinnamon	•Herbs (most): Arnica,	White Willow Bark	Spice/Herb	Curry	Vanilla	Nutmeg	Pudding/Jam/Jelly
	Valerian	Bergamot, Echinacea	Slippery Elm			Stevia		
	Licorice	Chrysanthemum,	Artemesia Annua					
	•Black Cohash	Ephedra, Feverfew,						
	Agave	Goldenseal,						
		Lemongrass						
		Alice Vera						
		Nettle						
		Angelica						
Sea Salt			Sulfite	Preservative	*MSG*	*Benzoate*	*Aspartame*	*Table Salt (NaCl)*
Mineral Water	•Kambucha	•Green or Mu Tea	Ginger Tea	Beverage	*Kona Coffee*	*Alcohol*	*Coffee*	*Beer, 'Soda'*
						Black Tea		Yeast/Hops/Malt
	Molasses	Rice Syrup	•Sucanat	Sweetner	Honey/MapleSyrup		Saccharin	Sugar/Cocoa
	Soy Sauce	Apple Cider Vinegar	•Umeboshi Vinegar	Vinegar	Rice Vinegar	Balsamic Vinegar	Red Wine Vinegar	White/Acetic Vinegar
•Umeboshi Plum		•Sake	•Algae, Blue Green	Therapeutic	*Antihistamines*		*Psychotropics*	*Antibiotics*
			•Ghee (Clarified	Processed Dairy	Cream/Butter	Cow Milk	•Casein, Milk	*Processed Cheese*
			Butter)				Protein,Cottage	
							Cheese	
			Human Breast Milk	Cow/Human	Yogurt	Aged Cheese	New Cheese	Ice Cream
				Soy		Soy Cheese	Soy Milk	
				Goat/Sheep		Goat/Sheep Cheese		
		•Quail Egg	•Duck Egg	Egg		Chicken Egg		
				Meat		Gelatin/Organs	Lamb/Mutton	Pork/Veal	Beef
				Game		•Venison	Boar/Elk/-Game Meat	Bear	
				Fish/Shell Fish		Fish	Mollusks	•Mussel/Squid	Shell Fish (Processed)
							Shell Fish (Whole)		•Lobster
				Fowl			Goose/Turkey	Chicken	Pheasant
			Oat	Grain		Wild Duck	•Triticale	Buckwheat	Maize	Barley
			'Grain Coffee'	Cereal			Millet	Wheat	Barley Groat	Processed Flour
			•Quinoa	Grass			Kasha	•Spelt/Teff/Kamut	Corn	
			Wild Rice				Brown Rice	Farina/Semolina	Rye	
			•Amaranth					White Rice	Oat Bran	
			Japonica Rice							
	Poppy Seed	Primrose Oil	Avocado Oil	Nut		Pumpkin Seed Oil	Almond Oil	Pistachio Seed	Cottonseed Oil/Meal
Pumpkin Seed	Cashew	Sesame Seed	Seeds (most)	Seed/Sprout		Grape Seed Oil	Sesame Oil	Chestnut Oil	Hazelnut
	Chestnut	Cod Liver Oil	Coconut Oil	Oil		Sunflower Oil	Safflower Oil	Lard	Walnut
	Pepper	Almond	Olive/Macadamia Oil			Pine Nut	Tapioca	Pecan	Brazil Nut
		•Sprout	Linseed/Flax Oil			Canola Oil	•Seitan or Tofu	Palm Kernel Oil	*Fried Food*
Lentil	Kohlrabi	Potato/Bell Pepper	Brussel Sprout	Bean		Spinach	Split Pea	Green Pea	Soybean
Broccoflower	Parsnip/Taro	Mushrooms/Fungi	Beet	Vegetable		Fava Bean	Pinto Bean	Peanut	Carob
•Seaweed	Garlic	Cauliflower	Chive/Cilantro			Kidney Bean	White Bean	Snow Pea	
Nori(Kombu)Wakame)Hijiki	Asparagus	Cabbage	Celery/Scallion			Black-eyed Pea	Navy/Red Bean		
Onion/Miso	Kale/Parsley	Rutabaga	Okra/Cucumber	Legume		String/Wax Bean	Adzuki Bean	Legumes (other)	
•Daikon/Taro Root	Endive/Arugula	•Salsify/Ginseng	Turnip Greens	Pulse		Zucchini	Lima or Mung Bean	Carrot	
•Sea Vegetables (other)	Mustard Greens	Eggplant	Squash	Root		Chutney	Chard	Chick/Pea/Garbanzo	
Dandelion Greens	Jerusalem Artichoke	Pumpkin	Artichoke			Rhubarb			
•Burdock/-Lotus Root		Collard Greens	Lettuce						
Sweet Potato/Yam	Broccoli	Ginger Root	Jicama						
Lime	Grapefruit	Lemon	Orange	Citrus Fruit		Coconut	Plum	Cranberry	
Nectarine	Canteloupe	Pear	Apricot			Guava	Prune	Pomegranate	
Persimmon	Honeydew	Avocado	Banana			•Pickled Fruit	Tomato		
Raspberry	Citrus	Apple	Blueberry			Dry Fruit			
Watermelon	Olive	Blackberry	Pineapple Juice	Fruit		Fig			
Tangerine	•Dewberry	Cherry	Raisin, Currant			Persimmon Juice			
Pineapple	Loganberry	Peach	Grape			•Cherimoya			
	Mango	Papaya	Strawberry			Date			

•Therapeutic: gourmet, or exotic items

Italicized items are NOT recommended

Prepared by Dr. Russell Jaffe, Feltrex Health Studies Colleague. Reprints available from Health Studies Colleague, 44621 Guilford Drive, #150, Ashburn, VA 20147, 888-326-7373. Sources include USDA food data base (Rev'd & 10), Food & Nutrition Encyclopedia, Nutrition Applied Personally, by M. Wadcoak, Acid & Alkaline by H. Aihara, Food growth, transport, storage, processing, preparation, combination, & assimilation influence effect intensity. Thanks to Helen Lyon for his original work. [Rev 4/98]

Table 6. Clinical Test Systems of Allergy and Immunity

	ACUTE	DELAYED CELL MEDIATED IMMUNITY		
Type Test/ What measured	**Acute**	**Humoral**	**Immune Complex**	**Cellular**
IgE ('RAST')	+	-	-	-
IgA	-	partial (only IgA)	-	-
IgM	-	partial (only IgM)	-	-
IgG (IgG - 'RAST')		partial (only total IgG)	-	-
IgG1	-	partial (only IgG1 subclass)	-	-
IgG2	-	partial (only IgG2 subclass)	-	-
IgG3	-	partial (only IgG3 subclass)	-	-
IgG4	-	partial (only IgG4 subclass)	-	-
Immune Complex (FICA)	-	-	+	-
Raji Cell Assay	-	-	+	-
Lymphocyte Culture (Thymidine Incorporation)	-	-	-	+
ELISA/ACT® Lymphocyte Assay	-	+	+	+

Table 7. Consequences of Maldigestion: Adverse Effects on Immune System Function From the Load of immunoreactive material Absorbed From Permeable Gut

1. Structural remnants: recognized as foreign antigens
2. Lectins: glycosides specifically activate lymphocytes or macrophages
3. Neuro/Immuno-toxic residue: Pesticides, fumigants, or growth regulators
4. Oxidants such as sulfites: used in food storage or processing
5. Intrinsic toxicants such as alkaloids, essential oils, or mutagens
6. Endotoxins: immune response amplifiers and pyrogens
7. Pathogen and parasite products: cyclosporin-type immune response inhibitors

Note: The immune system is a high amplification environment. Once sensitized, tiny amounts of compound can incite an amplified response.

Table 8. Nutrient Cofactors: Replacement Links to Improved Immune Function

Minerals	**Antioxidants**	**Phosphatides/Lipids**
electron transporting		
Magnesium	Beta-Carotene	Phosphotidylcholine
Zinc	Tocopherols	Phosphotidylethanolamine
Selenium	Ascorbate	w-3 Essential Fatty Acids
Chromium	Glutathione	w-6 Essential Fatty Acids
Manganese	Riboflavin	
Vanadium	Allyl sulfides	
Boron	Coenzyme Q10	
electron donating		
Copper		
Iron		

Table 9. Items assayable by LRA by ELISAACT (Updated)

FOODS (234 ITEMS)

Alfalfa
Algae (Chlorella)
Algae (Spirulina)
Allspice/Arrowroot
Almond
Amaranth
Anchovy
Anise Seed
Apple
Apricot
Artichoke
Asparagus
Avocado
Baking Powder
Banana
Barley
Basil
Bass
Bay Leaf
Bean, Garbanzo
Bean, Kidney
Bean, Lima
Bean, Mung
Bean, Navy/Ninja
Bean, Pinto/Frijole
Bean, Soya
Bean, String/Wax
Beef/Veal
Beet
Blackberry
Blueberry
Bok Choi
Boysenberry
Brazil Nut
Broccoli
Buckwheat/Kasha
Buffalo
Butter, Clarified (Ghee)
Butter, Whole
Cabbage/Brussels Sprouts
Cantaloupe/Honeydew
Caraway Seed
Carob
Carrot
Casein
Cashew
Catfish
Cauliflower
Celery
Chamomile
Chard
Cheese, Brick (Cow)
Cheese, Cottage (Cow)
Cheese, Parmesan (Cow)
Cheese, Processed (Cow)
Cheese, Romano (Sheep)
Cheese/Milk (Goat)
Cherry
Chestnut
Chicken
Chive
Chocolate/Cocoa
Cilantro
Cinnamon
Clam
Clove
Coconut
Cod Liver Oil
Codfish
Coffee, Decaf & Reg
Cola
Collard Greens
Coriander
Corn (Maize)
Cottonseed Oil
Crab
Cranberry
Cucumber
Cumin
Currant
Curry
Dahlia Flower
Date
Deer/Venison
Dill
Duck/Goose
Egg, White (Chicken)
Egg, Yolk (Chicken)
Eggplant
Endive
Fig
Flaxseed/Linseed Oil
Garlic
Gelatin
Gin (Juniper Berries)
Ginger
Gliadin
Gluten
Grapeseed Oil
Grape/Raisin, Green
Grape/Raisin, Red
Grapefruit
Haddock
Hazelnut/Filbert
Honey
Hops
Horseradish
Hydrogenated Oil
Kale
Kamut
Kelp/Seaweed
Kiwi
Kombu
Lactalbumin
Lactoglobulin
Lamb/Mutton
Leek
Lemon
Lentils, Red, Green
Lettuce, Iceberg
Lettuce, Red Leaf
Lettuce, Romaine
Lime
Lobster
Macadamia
Mace
Malt
Mango
Marjoram
Milk, Pasteurized (Cow)
Milk, Raw (Cow)
Millet
Molasses
Mushroom
Mustard Greens, Spice
Nectarine
Nutmeg
Oats
Okra
Olive
Onion, Scallion/Spring
Onion, Yellow
Orange
Oregano
Oyster
Papaya
Paprika
Parsley
Parsnip
Pea, Black-eyed
Pea, Green, Snow
Peach
Peanut
Pear
Pecan/Pine
Pepper, Black
Pepper, Cayenne
Pepper, Chili, Red
Pepper, Green, Red, Yellow
Pepper, White
Peppermint
Perch/Mackerel
Pimiento
Pineapple
Pistachio
Plum/Prune
*Poke Weed Mitogen**
Poppy Seed
Pork/Bacon/Ham
Potato, Sweet/Yam
Potato, White
Psyllium Seed
Pumpkin
Quinoa
Rabbit
Radish
Rapeseed/Canola Oil
Raspberry
Red Snapper
Rhubarb
Rice, Basmati
Rice, Brown
Rice, White
Rice, Wild
Rose Hips
Rosemary
Rutabaga
Rye
Safflower Oil
Sage
Salicylate
Salmon/Lox
Sardine
Scallop
Sesame/Tahini
Shrimp
Sole/Flounder/Halibut
Spearmint
Spelt
Spinach
Squash
Strawberry
Sucanat
Sugar, Beet
Sugar, Cane
Sugar, Corn
Sugar, Maple
Sunflower
Swordfish
Tamarind
Tangerine/Mandarin Orange
Tapioca
Tarragon
Tea, Black
Thyme
Tobacco
Tofu
Tomato
Triticale
Trout
Tuna
Turbot/Whitefish
Turkey
Turmeric
Turnip, Greens
Vanilla
Walnut, English
Walnut Oil, Black
Watercress
Watermelon
Wheat
Yeast, Baker's (Geotrichum)
Yeast, Brewer's (Torula)
Yogurt (Cow)

**under guidance may be used for selected therapeutic purposes*

Table 9. Items assayable by LRA by ELISAACT (Updated), continued

ENVIRONMENTAL CHEMICALS (60 ITEMS)

1,2 Dichlorobenzene	Cis-Dichloroethylene (1,2- Dichloroethylene)	Hexachlorocyclohexane	Propylene Glycol (1,2-Propanediol)
2,4,5 T	Cyclohexylamine	Isopropyl Ether	Pyrene
2,4 D	DBCP (1,2 Dibromo-3-chloropropane)	Latex	Selenium Sulfide
2-Methyl Pentane	DDT	Maleic Anhydride	Silicates/Silicone Dioxide
3-Methyl Pentane	DEET	Metallic Catalyst	Silicone
Aldrin	Detergent (Synthetic)	Methoxychlor	Soap (SDS/SLS)
Benzaldehyde	Dibutyl Phthalate	Methylene Chloride (Dichloromethane)	Tert-Butyl-Ethyl Ether
Benzene	Dieldrin	Morpholine	Tert-Butyl-Methyl Ether
Benzopyrene	Endrin	Nitrosamine Mix	Tetrachloroethylene
Benzyl Acetate	Ethyl Acetate	Organophosphates	Toluene
Beryllium Oxide	Ethyl Acetoacetate	Pentachlorophenol (PCP)	Trichloroethylene (TCE)
Carbamates	Ethyl Butyrate	Petroleum By-Products and Solvents	Vinyl Chloride
Carbon Disulfide	Ethylene Dibromide	Phenol	Xylene
Carbon Tetrachloride	Formaldehyde	Phthalates	
Chlordane	Halogenated Biocide	Polyvinylpyrrolidone/ Povidone	
Chloroform	Heptachlor		

MOLDS (28 ITEMS)

Alternaria alternata	Epidermophyton floccosum	Penicillium notatum	Trichophyton mentagrophytes goetzii
Aspergillus fumigatus	Fusarium vasinfectum	Penicillium roqueforti	Trichophyton mentagrophytes interdigit
Aspergillus niger	Helminthosporium halodes	Pullularia pullulans	Trichophyton rubrum
Aspergillus oryzae	Helminthosporium sativum	Rhizopus nigricans	Trichophyton schoenleinii
Botrytis cinerea	Mucor mucedo	Rhizopus stolonifer	
Candida albicans	Mucor racemosus	Rhodotorula	
Cladosporium cladosporioides	Penicillium chryosogenum	Thricothecium roseum	
Cladosporium herbarum	Penicillium frequentans	Trichophyton	

ADDITIVES/PRESERVATIVES (27 ITEMS)

Aspartame/Nutrasweet	Gum, Carrageenan	Pinene	Sodium Propionate
BHA	Gum, Guar	Polysorbate 60	Sorbitol
BHT	Gum, Locust Bean	Polysorbate 80	Sulfite/Metabisulfite
Caffeine	Gum, Tragacanth	Potassium Bromate	Xylitol
Calcium Propionate	Gum, Xanthan	Propyl Gallate	
Diacetyl (2,3 Butanedione)	MSG (Monosodium Glutamate)	Saccharine	
Gum, Acacia	Nitrates/Nitrites	Sodium Benzoate	
Gum, Agar		Sodium Fluoride	

FOOD COLORINGS (14 ITEMS)

Blue #1	Green #3	Red #2	Yellow #5
Blue #2	Orange #4	Red #3	Yellow #6
Brilliant Black	Ponceau 2R	Red #40	
Carmoisine	Ponceau 4R	Yellow #10	

TOXIC MINERALS/METALS (12 ITEMS)

Aluminum	Barium Sulfate	Lead	Silver
Antimony	Cadmium	Mercury	Tin/Stannous Chloride
Arsenic	Gold	Nickel (II) Chloride	Titanium Dioxide

Table 9. Items assayable by LRA by ELISAACT (Updated), continued

DANDERS/HAIR/FEATHERS (10 ITEMS)

Cat Dander (Felis cattus)	Guinea Pig Hair (Cavia porcellus)
Dog Dander (Canis familiaris)	Horse Dander (Equus caballus)
Duck Feathers (Anas platyrhynca)	Rabbit Hair (Oryctolagus cuniculus)
Goat Hair/Skin Scraping (Capra hircus)	Sheep Wool (Ovis aries)
Goose Feathers (Anser anser)	Turkey Feathers (Meleagris gallopavo)

MEDICATIONS (25 ITEMS)

Acetaminophen (Tylenol)	Diazepam (Valium)	Mesalamine (Asacol)	Streptomycin
Amitriptyline (Elavil)	Docosanol (Abreva)	Methylphenidate (Ritalin)	Tetracycline
Amoxicillin	Erythromycin	Naproxen (Aleve)	
Ampicillin	Fluconazole (Diflucan)	Nystatin	
Aspirin/Coal Tar	Guaifenesin (Mucinex)	Omeprazole (Prilosec)	
Cephalexin (Keflex)	Hydroxychloroquine	Penicillamine	
Ciprofloxacin (Cipro)	(Plaquenil)	Penicillin	
Clarithromycin (Biaxin)	Ibuprofen	Piroxicam (Feldene)	

THERAPEUTIC HERBS (18 ITEMS)

Arnica	Echinacea	Hypericum/St. John's Wort	Slippery Elm
Artemisia Anua	Ephedra	Lemongrass	Valerian
Bergamot	Feverfew	Licorice	White Willow Bark
Black Cohash	Goldenseal/Hydrastis	Lomatium	
Chrysanthemum	Hawthorne	Primrose Oil	

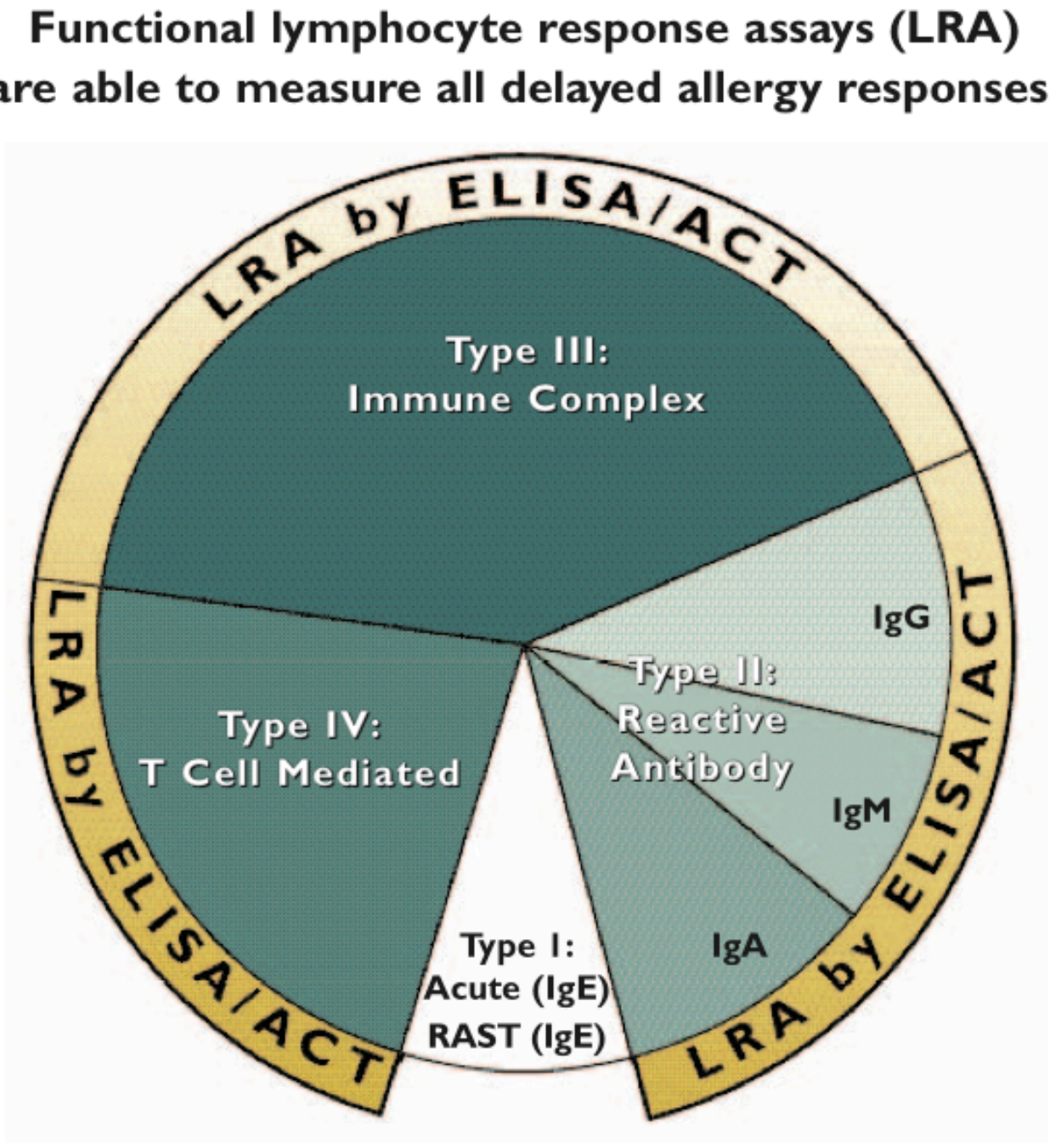
THERAPEUTIC FOODS (40 ITEMS)

Astragalus	Dried Laver	Miso, Brown	Resin
Bok Choi	Eel	Miso, Hatcho	Rice, Basmati
Buffalo	Elk	Miso, White	Royal Jelly
Cellulose/Hemicellulose	Ginseng, American	Mushroom, Shiitake	Sea Cucumber
Chinese Tea	Ginseng, Chinese	Mushroom, Straw	Snake, Rattle
Codium	Ginseng, Siberian	Mushroom, Wood Ear	Tamari
Cucumber, Japanese	Hijiki	Mustard Greens/Spice	Tofu
Dahlia Flower (Cultorum)	Horseradish	Plum, Umeboshi	Wakame
Dashi Kombu	Kombu	Quail	Water Chestnut
Dong Quai	Miso, Barley	Red Oil	Yaki Nori

Figure 1. Elements of an Immune Strengthening Program

What to Do	How to Accomplish
1. Immunologic Load Reduction	Profile Cell Mediate Immunity: (Substitute for immunoreactants)
2. Replace Cofactors	Nutrients Repletion
3. Toxicant Reduction	Low Temperature Saunas (for lipophilics) Penicillamine Chelation (for heavy metals)
4. Enhance Adaptive Skills	Therapeutic Biofeedback
5. Enhance Immune Competence	Phototherapy Phytotherapy Homeopathy Support System

Figure 2. Wheel of Immune Response Mechanisms



LRA by ELISA/ACT® is a true cell culture. Comprehensive, *ex vivo*, functional procedures have been proven in clinical outcome studies to provide superior, sustained improvements and long-term remissions in autoimmune and immune dysfunction conditions.

Figure 2. Wheel of Immune Response Mechanisms, continued

Acute Response	=	Type 1 (IgE)	=	Reagin
Delayed Response	=	Types 2, 3, & 4	=	DTH

Type 2	=	Humoral	= Antibody	=	IgA, IgM, IgG
Type 3	=	Immune Complex		=	Ag + Ab + Complement
Type 4	=	Cell Activation		=	Lectin/Cytokine

Only a lymphocyte response assay measures cell mediated reactions and functionally distinguishes protective from reactive antibody, *e.g.,* neutralizing and helpful from provocative and harmful IgG.

Accuracy and Predictive Value of LRA by ELISA/ACT

Precision and clinical reproducibility of lab tests can be assessed through asking the following three questions:

1. If multiple samples are taken, how do results agree?
2. If the same person is measured weekly, how do results agree?
3. If the same sample is analyzed when drawn, after shipping, and after three days storage,'

How do results compare?

In 300 blind split samples analyzed over 36 months, results replicated with an R value of >.999. There are occasional differences where a strong is read as intermediate or a marginal intermediate is read as not reactive. Otherwise, results are consistent and reproducible.

During method development, more than 3,000 different subjects were tested. This unusually large number of test subjects reflects the challenge of verifying a clinically reliable lymphocyte response assay system. When, on a constant dietary regiment, the same person is measured weekly (sometimes for months at a time), results replicate with an R value of .998.

When the same sample is analyzed fresh, after shipping, and after three days in the lab, results agree with an R value of .998. During his 24 month study, specimens were sent during different seasons and to different parts of the country to verify that consistent results would be consistently obtained. This procedure is the most reproducible lymphocyte assay used in any clinical lab, partly because of the one-step ELISA and partly because of averaging results (typically from $30\pm5 \times 10^3$ cells). We have gone to unusual lengths to provide a test that is clinically meaningful and predictive.

People often call to indicate how accurate or predictive the test is...especially in hard to identify or hidden offender foods. In people who doubted the accuracy of the ELISA/ACT®'s results, yet followed the program for 6 weeks or so and were then inadvertently exposed to a suspect food, strong symptomatic response (but unexpected) is often observed. While the immune system is in an active repair phase it may be able to (and often does) mount a stronger response to sensitized items. Later, when repair is complete, the person is often able to reintroduce the items without symptom provocation.

The period of repair and avoidance is referred to as a window of opportunity for people during which they may be able to recover from years of deferred repair and immune system impairment,

and after which they may have a reset immune system able to defend them without exaggerated symptomatic or hidden responses.

Figure 3. Low Temperature Saunas: Decrease Of Lipophilic Toxicants

Purpose: To mobilize and eliminate non-biodegradable, fat soluble, potentially immunosuppressive compounds.

Method: To use of low temperature saunas is highly recommended. Which equipment to use is a matter of personal preference and can be home 'sweat boxes', home saunas, or commercial saunas for all are acceptable. There are two components, which may be different from prior experiences with saunas: the temperature is lower (105-115 ˚F) and the time is longer (45-90 minutes daily at least 5 days per week).

There is work which suggests that fat soluble residues of PCBs, pesticides, and similar possible metabolic uncouplers or immunologic suppressants can be eliminated through the skin using this technique, especially when combined with proper transport cofactors (the antioxidants and B-Complex such as that found in comprehensive formulas). The principle is simple: the body's fat must be warmed to increase its solubility; the warmed fat must be transportable to the sweat glands which excrete fat; the process must continue long enough for appreciable 'fat sweat' to occur; the temperature must be low enough that the person does not loose significant amounts of water or elctrolytes; the sweat oils must be vigorously washed off. We find glycerin soaps (such as Neutrogena, Black Soap, and similar 'super fatted' soaps) the most effect here. A loofa to gently scrub is also helpful.

Results: Decrease in the stored total body burden of possibly immunosuppressive fat soluble non-biodegradable material. This external low temperature sauna has a net effect of 'cooling' the body.

Interpretation: From the recent, preliminary studies done, one can directly measure such excretion (using mass spectrometry). Based on the known potential of these compounds to competitively inhibit neurotransmitter, hormone, and endocrine function, it seems reasonable to reduce the body's burden of these chemicals. In the absence of quantitative studies, we recommend that this program continue for three (3) months on a 5-7 day/week basis and be followed by a three (3) day/week schedule for at least six (6) months.

Note: It is important to ensure that excreted oils be vigorously removed from the skin surface before they reabsorb. Following the sauna and scrub, we find that a cool to cold shower is invigorating.

Figure 4. Mineral Provocation Test for Essential and Heavy (Toxic) Metals

Purpose: To determine the body's burden of mobilizable, potentially toxic minerals.

Method: A short course of D-Penicillamine (Cupramine™; De-Pen™) or N-Acetyl-D-Penicillamine is prescribed by your health professional. During this time, you collect a 24˚ urine. The urine is submitted to a clinical laboratory for analysis of heavy metals to include: lead, mercury, cadmium, nickel, aluminum, and arsenic.

Program: Take 500 mg (2 capsules of 250 mg. each) D-Penicillamine [Cupramine™, De-Pen™] or N-Acetyl-D-Penicillamine with each meal and before bed for three (3) days. This is a total of 2 grams each day for three days based on a dose of 30 mg/kgm/day.

Starting on the morning of the second day collect in a heavy-metal-free container (usually provided by the doctor or the laboratory) all your urine for the next day (a full 24 hour cycle). It is quite important to collect ALL the urine. If you miss a sample, re-start, from the beginning. You can pour out what was collected and begin again using the sme collection container. Take the entire collection to the laboratory as soon as possible after completion. It is desirable, though not necessary, to keep the urine refrigerated during the collection period.

Because of short term effects on other minerals, this specimen should not be used for calcium or other mineral balance studies. The specimen can be used to check kidney function and to analyze for most hormones, neurotransmitter metabolites, etc.

This short course of D-Penicillamine avoids the rare side effects of longer-term therapeutic doses of the drug. Of course, if you note any adverse response, notify your health professional immediately and discontinue taking the medication until otherwise instructed.

Interpretation: Each laboratory has an applicable reference range for each mineral assayed. Elevation above the range reported by that laboratory is indicative of increased tissue stores of that heavy metal. For modest amounts of toxic minerals, an alkaline diet combined with therapeutic amounts of antioxidants plus calcium, magnesium, and zinc as the aspartate, orotate, or gluconate (in increase tissue uptake) and fluids in excess of 3 quarts per day may be sufficient to 'wash out' these elements. A repeat provocative heavy metal test after 30-60 days is recommended to assure that the heavy metals have been removed. For more than modest amounts, alternate day D-Penicillamine for 30-60 days with supplemental calcium, magnesium, and zinc on the other days to replace these minerals which penicillamine will chelate along with the other divalent (double charged) heavy metals. People should take therapeutic doses of intoxicants, as well. Under these conditions, side effects from the penicillamine are exceedingly rare. Of course, any adverse response is reason to stop the pencillamine and reevaluate the clinical situation.

Figure 5. Photobiology for Immunoregulation: A Regulator of Brain Rhythms

During the day certain brain rhythms are maintained by fluctuations of light intensity and spectrum. Recent research links mood changes to seasonal and circadian fluxes. Other studies suggest that seasonal depression may be reduced by exposure to appropriate lightning sources.

The sun produces a spectrum of color generated by refraction. Most mechanical sources produce color by pigment subtraction. in contrast, dichromatic sources, which are the most suitable for photobiologic effects, use materials of differing refractive indices to generate color. Both visual and non-visual pathways are employed.

Program: The person sits four to six feet from the face of a green light for 20 minutes twice daily. This is typically done in the morning and early evening. A socket-clamp light holder can facilitate positioning of the color source. During this time other activities (such as deep breathing, relaxation reflex, guided imagery, range of motion exercises, certain reading) can be performed simultaneously. The person need not look directly at the light. Deep brain structures and chemical pathways can be health-adapted by this action.

If indicated by clinical experience, yellow, amber, or blue dichromatics can be arrange to shine on the back, chest, abdomen, or any other specific area of the body. The same position and time conditions apply. Several lights can be used simultaneously. It is best if these are the sole source of illumination.

This program is based on the early work of Babbitt, Jadhiali, Dharmawara and others, and the more recent studies by Rosenthal and of Lewy.

Resources:
PAR 38 DICHROMATIC 150 WATT Spot or Flood lights: In the United States both Sylvania and General Electric produce these items. Quality lighting suppliers, particularly those specializing in outdoor or theatrical lighting (where true color rendering is important), should either carry or be able to obtain these lights for you. They are available in Washington DC at Eck Electrical, 1135 Okie Street NE (202) 526-9505; in Rockville, MD, at Ben Lust Theater Supply, Rockville Pike and Nicholson Road (301) 468-9128; and in Fairfax, VA, at Interstate Electric, 8435 Lee Highway (703) 560-2500. They are available in New York city at Just Bulbs (212) 228-7820) and Rosetta Lights (212) 719-4381.

Of particular interest is the book **Sunlight** by Zane R. Kime, MD, MS ($11.95, World Health Publications, Box Number 408, Penryn, CA 95663).

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