Urinary Neurotransmitters
Biomarker for Psychiatric Disorders

Functional Lab Testing
Scientifically Determining Supplement Prescribing

Chelating Toxic Elements
Challenges of Detoxifying Mercury, Arsenic and Lead

Growth Hormone Secretagogues
Why Growth Hormone May Not Be Good Medicine

Vitamin D Supplementation
A Cause of Immunosuppression?
Author’s note: Parts 1 & 2 of this series appeared in the Jan & Feb/March 2006 issues of Townsend Letter (available this month at www.townsendletter.com). This article (part 3) is an update of functional, predictive, sensitive, and specific lab tests. Integrative immune system defense and repair assessments and treatment guides are described.

In previous articles in this series, we reviewed that when healthy, we are tolerant to and resilient in the world outside us. We are resistant to infection and recycle any foreign antigens to which we are exposed. Our immune defense and repair system has the dual responsibilities of protecting us from the outside world and repairing us from daily wear-and-tear.

Capacity of the immune system is finite. Regular and substantial exposure to environmental and food digestive remnant antigens can overload the immune system to an extent that defense becomes the primary role of the immune system and repair gets deferred until the situation improves. Reliable and accurate detection of these antigens is key to understanding the causes of autoimmune, chronic, and degenerative illnesses as well as to assessing the functional status of our health.¹

As Bruce McEwan, a colleague from Rockefeller University, summarizes the dual nature of stress response, “Stress protects under acute conditions, but when activated chronically, it can cause damage and accelerate disease.” His text The End of Stress as We Know It is recommended to those who want a deeper understanding of stress responses and adaptation to them.

This article extends our series by looking at how what we eat and drink, as well as what we think and do, impact our health. Emphasis is on understanding, assessing, and getting feedback from the immune system. This allows us to know if our immune defense and repair system is getting the essential nutrients and other factors needed to keep an alkaline reserve, protect from oxidative stress, and communicate homeostatic balance in the integrated control system known as the psycho-neuro-immuno-hormonal system. The gut and central nervous systems are regulated through this higher, integrative control system.

Galen and Gambino’s Beyond Normality called attention to the strengths and limits of comparing people to lab values based on “usual” statistical ranges in the mid-70s (Galen R, Gambino S. Beyond Normality: The Predictive Value and Efficiency of Medical Diagnoses. New York: Wiley; 1975). Comparing people with themselves has been found more predictive of helpful outcomes and is fundamental to the emerging paradigm of integrative health care. Personalized care has stimulated development of functional metabolic, immune, hormonal, and neurochemical tests. Integrative medicine uses these tests with a focus on redressing causes to achieve the fullest possible health restoration or sustained remission for each individual. More conventional use of the tests is to assess symptomatic consequences that can form the basis of a “symptom suppressive” care model. This is an extension of the biochemical individuality concept developed by Roger Williams and Emanuel Cheraskin, MD, DMD.

The Immune System Defines Who We Are in Relation to the World Around Us

Immune system functions are so pervasive that they are fundamental to overall health and well-being. This article emphasizes tests and their clinical meaning as well as the essential nutrients commonly needed to sustain healthy immune system functions. When robust and healthy, our immune system repairs us from daily wear-and-tear, leaving us resilient to the challenges of life. In addition, the immune system is charged with identifying and marking for elimination any abnormal cells that form anywhere in the body. Further, neutralizing any foreign invader is a core responsibility for health maintenance.²

Infectious or Not, All Foreign Invaders Are Treated the Same

All foreign invaders in the body are treated the same, which means digestive remnants and infectious agents are dealt with identically by the immune system; they are both “not self” and therefore must be recycled. If first responder cells fail, if recycling becomes overloaded, then reserve
immune system components are called in to adapt an
offensive response to the invasion.3

Given that two-thirds or more of the body’s entire
immune system is in the intestinal lining (or Peyer’s
patches, as they are known), this suggests the importance
of interactions between the gut and the control system of
the body. This also means that when our immune system
is preoccupied with digestive remnants and intestinal
antigens that enter through a “leaky” or under-repaired
intestinal wall, it is more hospitable to infectious agents
to which people are exposed. In other words, if our immune
system is not able to recycle the invader through dendritic
cell actions nor neutralize it through lymphocyte responses,
the infection may be able to hijack our energy systems to
feed itself at our expense.

Autoimmune, chronic and degenerative illnesses
emerge, depending on which system or systems are most
stressed. Too many depend upon our reserve forces for
daily function and survival. Examples are given below.
Restored homeostasis and sustained remission is highly
likely.4

Homeostasis First: Effective Dendritic First Responders
Protect and Defend

“When deficit in any essential nutrient leads to dysfunction in
total system(s) that depend upon that nutrient.”
Justus Baron von Leibig (1837)

“Lack of anything essential makes the whole system
dysfunction.”
paraphrase of von Leibig
by Russ Jaffe, IAACN Annual Meeting 1990

When healthy, people have self-restoring core systems
that rebalance and keep them resilient, tolerant, and feeling
well. Known as homeostasis, this reflects our biological
bank account to which we can deposit and from which we
can withdraw until we become overdrawn. Overdrawn in
this context means we are deficient in essential nutrients,
able to detoxify internal and external xenotoxins, or
imbalanced in stress responses.

When challenged, our first responders are dendritic
cells of many subtypes, with specific dendritic cells
for each specialized system in the body along with circulating
surveillance cells. Dendritic cells protect and defend and
are motile and multi-functional. They include mast cells,
monocytes, granulocytes (polys), fibroblasts, endothelial
cells lining blood vessels, Kupffer Cells in the liver,
sinusoidal cells in the spleen, astrocytes and glial cells in
the brain.5 While often under-appreciated, dendritic cells
perform the following:

1. Take up xenotoxins first to protect more delicate
   systems. This also makes them exquisitely sensitive
to xenotoxin bioaccumulation.
2. Detoxify harmful chemicals in their mitochondrial
cytochrome and cytosol phase 1 & 2 detoxification
   systems
3. Repair basement membrane and other structural
   proteins, e.g., collagen, elastin, and related
glycoproteins
4. Circulate to sense healthy and cancer cells so that
   the abnormal cells can be deleted.
   Cancer can only occur when innate anticancer
   mechanisms have become dysfunctional.
5. Have high requirements for essential nutrients that
   are commonly used up and become deficient such as
   the following:
   a. Hydration as assessed by skin pinch and release
test
   b. Omega 3s (EPA, DHA, CLA) essential fatty acids
      with 1-3 grams daily recommended divided
      among all three needed omega 3 EFAs
   c. Buffering minerals, particularly magnesium, and
      including concurrent choline citrate to facilitate
      magnesium uptake, sufficient to keep first morning
      urine pH in the healthy 6.5-7.5 range (Figure 1)
   d. Protective antioxidants such as ascorbates, based
      on the individual ascorbate calibration protocol,
      quercetin dihydrate flavonoids (0.5-5 gm/day),
      and soluble OPC flavonols (5-50 mg/day) equal
to a full day’s servings of fruits and vegetables to
      provide ORAC free radical protection and prevent
      oxidative stress
   e. L-Carnitine fumarate (250-1000 mg/day) in
      micellized in medium chain triglycerides to facilitate fat metabolism.
   Carnitine is the shovel that brings the fat fuel to
   the cell furnace in the mitochondria.

Tolerance and Homeostasis Lost: Dendritic Exhaustion
Calls for Reserve Responses

“While healthy people have a tenfold reserve in most
systems, it is increasingly easy to overwhelm and exhaust
personal health reserves.”
Len Duhl, personal communication, 8/8/08

The first sign that our immune system is wearing down
is that innate immune system dendritic cells call for
reserve immune system components to mount an acquired
response. This means that repair is deferred, and foreign
invasion, beyond what can be neutralized by available
dendritic cell resources, becomes increasingly common.

Such acquired immune responses have become so
common that it is uncommon to meet someone able
to reply upon their dendritic cells for defense and repair
functions without calling for antibody or T-cell lymphocyte
backup.

Functional deficits in dendritic cell action occur only
when the following take place:

1. Essential nutrients are in deficit as outlined above
   and detailed below;
2. Xenotoxins, including biocides, medications, solvent
   residues, and/or toxic minerals, come in beyond the
adaptive capacity of the dendritic cells to metabolize and detoxify them;
3. Learned distress has overwhelmed control system hormonal and neurochemical balance, causing relative cortisol and adrenalin excess.

Acquired Immune Responses: Mucosa to Marrow

“From garden to table, from farm to fork, we deserve safer, more nutritious, health-promoting foods.”
Beatrice Trum Hunter
Nutrition for Optimal Health Association (NOHA)
Chicago, Illinois, May 1978

When dendritic cells can no longer handle the immune systems workload, they call upon adaptive responses. Dendritic cells process and present the foreign antigen to be reacted against to naïve, CD3 lymphocytes. Based on the Gel and Coombs nomenclature introduced in 1967, these can be antibody (B cell/plasma cell, type 2) or Immune complex (type 3) or T-cell (Th1 or Th2 dominant, type 4) responses.

Collateral Effects: Metabolic, Hormonal, and Neurochemical

“The control system of the human body is known as the governing vessel in traditional Oriental medicine and the psycho-neuro-immuno-hormonal system in Western science.”
Russ Jaffe to Xing Wu and Maurice Mussat Wainright House
Symposium on Acupuncture, April 1977

Whenever immune responses are stressed, there are consequences for the metabolic, hormonal, and neurochemical aspects of the control system. This is because the immune, hormonal, and neurochemical systems are parts of a common governing system in the body. This means that anything that influences any of the three components influences the other.

Tolerance and Homeostasis Lost: Exhausted Dendritic Cells Call for Help from Acquired Lymphocyte Responses

“Intolerance and hopelessness are routed in a loss of homeostatic feedback in those who lack the practices to restore balance when it is lost.”
Bhante Dharmawara
World Future Society Meeting on Future Scenarios in Health
Toronto, Canada, 1979

When healthy, any foreign immunoreactants or “antigens” that gain entry are promptly identified, engulfed, and recycled by our ample supply of dendritic (phagocytic) surveillance cells.3-6 The types of foreign antigens that the immune system is responsible for neutralizing when we are healthy – or addressing when our immune defenses are burdened – are generally glycoproteins or lipoproteins and include the following:
1. Infectious agents,
2. Inhaled pollen or aeroallergens,
3. Digestive food remnants,
4. Pathogenic dysbiotic organisms and parasite antigens.

In contrast, when burdened by maldigested antigens or antigens from dysbiotic intestinal pathogens and parasites, our immune defenses are less able to neutralize infectious or aeroallergen antigens and haptons.5-15 In this circumstance, our body defers needed repair, develops inflammation as a result, and expresses the signs and symptoms of delayed allergic autoimmune and immune dysfunction pathologies that became, in the nineteenth century, the basis for our descriptive, symptom-oriented, conventional health care system.6-8

Tests of Immune System Function and Their Clinical Meaning

“Trust yet verify”
President Ronald Reagan, 40th President of the United States

The tests described are those with the highest predictive significance, with better sensitivity and specificity. In general, this means the functional and person-specific tests and assessments, as described here and in the next section. Conditions that benefit from these tests include autoimmune, chronic, and degenerative diseases. This includes the autoimmune conditions specific to each part of the body before they were understood as having a common set of causes in immune system-acquired self-attack.9

Autoimmune chronic conditions include the following:
1. Diabetes (both type 1 and type 2) and its precursors, obesity, and metabolic syndrome
2. Rheumatoid arthritis in the joints
3. Asthma and pneumonitis in the lungs
4. Irritable bowel syndrome, regional enteritis, and ulcerative colitis in the intestines
5. Eczema and psoriasis in the skin
6. Multiple Sclerosis in the brain

Acronyms and Abbreviations

CFIDS = chronic fatigue immune dysfunction syndrome
d-pen = d-penicillamine provocative tests for essential and toxic minerals,
DHEA = dehydroepiandosterone
HPA = hypothalamic pituitary adrenal feedback system
LRA by ELISA/ACT = lymphocyte response assay by enzyme-linked immunosorbed assay and advanced cell culture based on kinase enzyme activation
MCT = medium chain triglycerides that help alkalinize the body
MELISA = modified enzyme linked immune system assay by radio-labeled thymidine uptake
NAE = Net acid excess; reflects balance in days acid-alkaline status
NK = natural killer
PAK = pyridoxal-alpha-ketoglutarate
pH = log of hydrogen ion
POPs = Persisting organic pollutants

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Specific tests of immune function include the following:

1. Inflammation can be measured through any of the inductible protein systems of the body, from Sedimentation rate (Sed Rate), to fibrinogen, ferritin, microglobulin, prealbumin, C-reactive protein (CRP), or tumor necrosis factor (TNF). Inflammation is cumulative repair deficits. The more affected area of the body is the one with the most accumulated wear-and-tear or distress.

2. Phagocytic Index for function of dendritic cells measures how many organisms a granulocyte can engulf under standard conditions. Healthy dendritic cells can typically take up 50 organisms per cell.

3. Reactive immunity is evoked when innate passive immunity based on dendritic cells is asked to do more than they can handle:
   - a. Acute (type 1, immediate hypersensitivity): IgE antibody measurable by RAST (serum) test or by skin prick tests reflecting the histaminic, reaginic, or Ishizaka responsiveness. This is all that conventional skin testing measures. Our experience is that type 1 responses reflect overload of immune responses. When the immune system is restored to homeostatic resilience, type 1 reactions usually abate as IgG4 antibody levels increase to balance the IgE.
   - b. Delayed late phase reactions due to reactive but not neutralizing antibodies (type 2), immune complex (IgM anti-IgG antigen complex, type 3), and T-cell-mediated (type 4) hypersensitivities or delayed allergies can be best measured by functional lymphocyte response assays such as LRA by ELISA/ACT and MELISA. They are the current state-of-the-art tests of comprehensive delayed hypersensitivity, delayed allergy tests for foods, and environmental chemicals (Figure 2).

Initial antibody responses are IgM. They are strong yet short lived, typically three to six months. In contrast, IgG and IgA in serum and secretory IgA in mucosal secretion (sIgA) appear months after initial antigen exposure but carry that memory through the lifespan as long as the immune system remains healthy and resilient.

Delayed allergy mechanisms addresses the basic burden on immune defense and repair systems. The more attention to defensive reaction from delayed allergies, the less ability the immune system has to devote to necessary repair. Cumulative deferral of repair results in increased permeability in tissues that have the greatest wear-and-tear – those that are distressed. Cumulative repair deficits are clinically known as inflammation. Fundamentally, we can understand inflammation as incomplete or blocked repair.

Functional, comprehensive, ex vivo assessment of all delayed allergy mechanisms: LRA by ELISA/ACT tests are unique in that they measure all delayed allergy pathways. This lymphocyte response assay (LRA) is functional. This means immune memory lymphocytes (both B- and T-cells) respond to potential reactants under laboratory controls. For example, beneficial, protective, neutralizing IgG antibodies are not detected while harmful, reactive, complement-activating IgG antibodies are detected. This is in contrast to serum ELISA IgG or EIA tests that detect the presence of an antibody but do not assess if the antibody function is neutralizing and helpful or complement fixing and harmful.

The LRA by ELISA/ACT tests are comprehensive in that B-cell-mediated antibodies, immune complexes, and T-cell-mediated reactions are all measured. Performed in CLIA certified facilities, these assays have exceptional reproducibility and clinical predictive significance. Further, the LRA by ELISA/ACT tests are ex vivo in that the cells react just as they do in the body yet under direct laboratory observation.

Reproducibility of LRA by ELISA/ACT on split samples is unusually consistent, being greater than 98% at least to pass quality control. With over 5,000 split samples analyzed, the consistency of the LRA by ELISA/ACT is dramatically different from any other lymphocyte response assay. This is because of the added improvement in signal-to-notice ratio afforded by the novel ELISA part of ELISA/ACT, which uses the lymphocyte as the source of enzyme amplification. Day-to-day variations in LRA by ELISA/ACT results are greater than 97% reproducible. This is excellent for any assay and particularly for a cell response assay. Part of the assay robustness is due to averaging the results from thousands of cells in the assay (data on file and available at www.elisaact.com).
From antioxidants to buffering minerals, from xenotoxins to detoxification mechanisms, from measures of net acid excess (NAE) to digestive competence, from hormonal balance to vitamin levels, the following tests provide essential insights into immune system functions in humans and related higher primates, including Orangutans and Bonobos.17

1. **Ascorbate calibration** as measure of ReDox, methylation efficiency, and inflammation or repair deficit.18

Vitamin C is nature’s most potent and safest antioxidant cofactor. While it is not technically a vitamin (vital amine), ascorbate aids in the maintenance of cellular membranes, cellular respiration, the peroxidase cleansing system, and the restoration of vitamin E, selenomethionine complexes, and sulfhydryl enzymes such as glutathione synthetase, thereby helping to detoxify various drugs and chemicals. These same systems are vulnerable to overload from environmental chemicals that deplete essential antioxidant intermediates such as glutathione, ascorbate, or co-enzyme Q10.

Ascorbate is also required for hormone biosynthesis and to maintain the integrity of connective tissue, capillaries, bones, joints, muscles, and teeth. Ascorbate is essential in wound repair and tissue healing.

Ascorbate has been shown to increase cellular resistance to many common viral infections (most probably due to its interferon-like activity) and enhance specific parameters of immune function. All these actions of ascorbate are related to its antioxidant or reducing or electron-donating abilities. Rapid consumption of ascorbate occurs in cells of people with chronic conditions like fibromyalgia muscle pain, CFIDS, and other chronic immune dysfunction conditions.20

We recommend individualized calibration of ascorbate need to achieve beneficial cellular ascorbate levels (Figure 3). Ascorbate calibration17 is a functional test that measures antioxidant need and turnover and is thus a functional measure of oxidative stress. Based on ascorbate calibration, it is evident from Figure 3 that 80% of people require at least 10 g of ascorbate daily for optimum physiological function, and this amount can be as high as 130g/day.

2. **D-penicillamine tests for essential and toxic minerals**: measurement of buffering minerals using such standardized and validated protocols such as the d-penicillamine provocation tests for both essential and for toxic minerals19 (Tables 1 and 2)

The advantage over other provocative agents is twofold:

a) Forty years of experience with the safer use of penicillamine in treating copper mineral overload as well as for radioprotection

b) Only this assay provides information about the essential nutritional minerals. Other agents are selective; penicillamine picks up all divalents.

3. **First AM urine pH** for assessment of metabolic acidosis

Eating foods that can be digested completely without triggering local or systemic immune responses is helpful. During repair or recovery phase, this means 80% by volume eaten of alkaline-forming foods. These are easier to digest while providing bulk and essential nutrients in contrast to acid-forming foods that provide dense calories but low nutrient density.

Eating “The Alkaline Way”19 concurrently energizes and detoxifies the body so that cell metabolic systems are restored to their efficient, resilient states. The chart in Table 3 of food effects on body chemistry is useful in implementing “The Alkaline Way” in daily practice. The preferred alkaline-forming foods are on the left side; the acid-forming foods are on the right side.

**Table 1: Mineral value ranges for nutritional and toxic minerals in second-day 24º urine after d-penicillamine provocation, 7.5 mg./Kgm; q.i.d. for three days [N=200]**

<table>
<thead>
<tr>
<th>Mineral element</th>
<th>Reference Range mg./gm Creatinine</th>
<th>Reference Range mg./24º sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutritional Minerals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>310 - 620</td>
<td>400 - 900</td>
</tr>
<tr>
<td>Magnesium</td>
<td>250 - 550</td>
<td>350 - 700</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.8 - 1.3</td>
<td>1.1 - 1.5</td>
</tr>
<tr>
<td>Copper</td>
<td>0.04 - 0.06</td>
<td>0.06 - 0.08</td>
</tr>
<tr>
<td>Iron</td>
<td>0.20 - 0.30</td>
<td>0.24 - 0.36</td>
</tr>
<tr>
<td>Manganese</td>
<td>0.005 - 0.007</td>
<td>0.006 - 0.008</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>0.11 - 0.14</td>
<td>0.13 - 0.19</td>
</tr>
<tr>
<td>Boron</td>
<td>4.1 - 5.6</td>
<td>5.8 - 6.7</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.19 - 0.30</td>
<td>0.21 - 0.33</td>
</tr>
<tr>
<td>Cobalt</td>
<td>0.04 - 0.06</td>
<td>0.05 - 0.07</td>
</tr>
<tr>
<td>Selenium</td>
<td>0.25 - 0.31</td>
<td>0.24 - 0.35</td>
</tr>
<tr>
<td>Vanadium</td>
<td>0.02 - 0.03</td>
<td>0.03 - 0.04</td>
</tr>
</tbody>
</table>

Note: Values lower than the reference range in provoked specimens suggests deficiency of the above needed essential minerals. Adequacy of supplemental intake to replenish deficits can be monitored by repeat d-penicillamine provocation every three months.
Human cells are optimized around a narrow pH range. Even small (hundredths of a pH unit) shifts to the acid or alkaline sides that are uncompensated induce substantial loss of cell efficiency in energy production, protein synthesis, essential transport, and overall metabolic competence.

Saliva is a useful tool in people with healthy gingiva. If gingiva is not healthy, the serous fluid exudate makes saliva pH no longer representative of NAE. Clinically, first morning urine pH is the more reliable specimen for determining NAE. 21

4. First AM urine specific gravity to assess kidney concentrating capacity

First AM urine concentrating capacity (specific gravity) is the best early measure of how healthy the kidneys are through measuring their concentrating capacity. The role of the kidneys is to aid in the clearance of toxins, toxicants, and metabolic waste. The body excretes some of these waste molecules via urination, and the role of the kidney is to concentrate the urine, so that such waste molecules can be excreted with minimal loss of water and nutrients. A urine-specific gravity of >1.02g/ml is a sign of healthy functioning kidney tubules and glomerulae. The interpretation of other kidney function parameters like BUN and serum creatinine is also influenced by the specific gravity of the urine.

5. Digestive Transit time assessment via charcoal capsules

A healthy "transit time" from food consumption through digestion, assimilation, and waste elimination is an efficient 12-18 hour interval. We can use transit time measurements as an overall assessment of digestive health. This can be done easily with the use of charcoal capsules. In general, 10-12 charcoal capsules (Requa) are taken on an empty stomach with water. The start time is noted. When "black stuff" is noted in the stool, the completion time is noted. The difference in hours is the transit time. Detailed stool digestive analysis tests are indicated if the transit time is either too long or too short.

Restoration of digestive competence if transit time is >18 hours

Restoration means redressing the causes of maldigestion, dysbiosis, mucosal inflammation, and enteropathy, which includes the following:

a. Eating foods that can be more completely digested without triggering focal or systemic immune responses. This can be based on self-tests or on comprehensive, functional tests of food and chemical hypersensitivity such as LRA by ELISA/ACT and MELISA.

b. Eating in ways that enhance the digestion of food to healthy building blocks.

These building blocks include amino acids, di- and tri-peptides, sugars, glycerides, and fatty acids.

c. Replenishing a probiotic healthy microflora with 20-40 Bn viable organisms daily.

d. Stimulating repair of intestinal capacity and rebuilding areas of focal intestinal atrophy (enteropathy), which means providing energy for repair from l-glutamine (best recycled with the benefit of PAK [pyridoxal-alpha-ketoglutarate] to avoid glutamine build-up outside cells as excitoneurotoxins). This also means enhancing efficient removal of environmental toxins, from toxic minerals to hormone mimic biocides to solvent residues. This has the benefit of staying within physiologic levels and avoiding glutamate build-up outside nerve cells.

We suggest 1.5 gm l-glutamine combined with 0.5 gm PAK taken on rising and before bed on any empty stomach. Additional doses can be beneficial 30-60 minutes before exercise or "work-outs." Note that adding pyridoxine (B6) to alpha ketoglutarate does not work as an alternative.

e. Secretory IgA (sIgA) as measure of mucosal immune status.

Atrophy of intestinal wall surface area and diminished healthy intestinal mucosal immune defense mucus and secretory IgA antibodies are among the functional losses of immune status. If transit time is shorter than 12 hours, hypermotility and attended decreases in nutrient uptake should be investigated. 21

6. Vitamin Profile to include the following:

a. Vitamin A, retinols in plasma.

b. Vitamin Bs by enzyme kinetic assay in whole blood.

c. Vitamin C by oral ascorbate calibration.

d. Vitamin D or 25OH-cholecalciferol in plasma.

e. Fatty acid analysis from red cell membranes.

f. Secretory IgA (sIgA) as measure of mucosal immune status.

g. Iron, TIBC, and ferritin in serum.

7. Adrenal / HPA Axis assessment of hormone rhythm and balance: free cortisol / DHEA (saliva or plasma taken on rising, mid-day, late afternoon, and before bed to assess adrenal response.

In a recently concluded assessment, we were able to show improved adrenal stress indices (ASI) after just six weeks on a unique, comprehensive combination of Rhodiola, Phellodendron, Magnolia micellized in perilla oil, and MCT. This improvement occurs sooner than in most hormone studies, which require six months or more to show benefits. 23 Striking improvement in glucose/insulin energy regulation concurrent with improved
HPA axis (cortisol/DHEA) function was also observed in our studies confirming the direct link between adrenal fatigue (cortisol / DHEA dysrhythm) and glucose / insulin energy regulation (Figure 4). Figure 5 illustrates a case example wherein improvement in the cortisol DHEA ratio coincided with glucose and insulin regulation.

8. **Thyroid hormone function tests**: Free T3, Free T4, and TSH to assess thyroid hormones plus anti-thyroid antibody studies if thyroiditis is suspected

   Healthy TSH is 0.5-2.5 IU/ml. Autoimmune thyroiditis is increasingly recognized and appears to be more common in people with thyroid dysfunction in the twenty-first century than in the twentieth century.

9. **Oxidative Stress and methylation**: Homocysteine (healthy values are < 6 mg/dl in plasma) and oxidized cholesterol, oxidized LDL, and 8-oxo-guanine are undetectable in healthy urine because of antioxidant protection and thus lack of oxidative damage.

10. **Detoxification** pathways can be measured via their products.

   Hippurates reflect glycine status; glucarates reflect d-glucaric acid conjugation; mercapturates reflect thiol or cysteine conjugation; sulfates are an additional detoxification conjugation pathway. These different mechanisms for making toxins more water-soluble and less generative of free radicals are our detoxification systems.

   Sulfites (urine) are not present in healthy people. Sulfite presence in the urine reflect molybdenum deficit, as the sulfite oxidase enzyme is molybdenum-dependent.

**Case Example**

WC was a typical 50-year-old, a successful Latino male teacher, father of five (four living), who presented with a long history of labile hypertension, intermittent sleep and mood disorders, and an anxiety about his future. The medical, social, environmental, and family histories were unremarkable.

Self tests revealed the following:

1. First AM urine pH was consistently 5-6, despite following an alkaline way diet for three months.
2. Transit time was observed at 136 hours. Follow-up comprehensive stool digestive analysis revealed dysbiosis (three pathogens, sensitive to garlic and ginger), maldigestion particularly of fats and protein, as well as evidence of enteropathy and altered mucosal uptake as a consequence.

3. Ascorbate calibration determined that 30 grams were needed to calibrate. Weekly calibrations were repeated while he maintained a daily intake at 75% of calibration amount to satisfy daily needs.

4. D-penicillamine provocation tests for nutritional and toxic minerals revealed a deficit in magnesium and an excess of arsenic and lead. Biological detoxification was carried out and d-penicillamine added on Monday and Thursday for three months at 7.5 mg/kgm QID. In addition, ionized magnesium salts and choline citrate were given (three to six doses daily) to restore and maintain first AM urine pH in the healthy 6.5-7.5 range.

5. LRA by ELISA/ACT tests were performed. Reaction to propyl gallate, gluten, and sulfite were found. After careful counseling about hidden sources and exposures to reactive items, WC agreed to substitute for reactors for six months, following an immune-tolerance resetting program as part of his healing.

Based on the above tests and self-assessments, WC was started on comprehensive supplementation to improve magnesium uptake through concurrent choline citrate administration, adrenal, digestive prebiotic and probiotic flora as well as recycled glutamine to stimulate repair. Detoxification assessment revealed selective deficit in mercapturates. Increase in sulfur-rich foods were then included including daily choice of one or more of ginger, garlic, onions, brassica sprouts, and eggs.

Over a six-month period, WC found himself more resilient, reported improved restorative sleep, and was more hopeful about his life. Follow-up tests revealed the following:

1. First AM urine pH returned to and remained in the goal range of 6.5-7.5.
2. Transit time improved to 24 hours.
3. Ascorbate calibration reached a peak value of 50 grams after two months and had reduced to 12 grams by the end of six months.
4. D-penicillamine provocation showed the magnesium deficit had been corrected and that lead and arsenic were no longer detectable although increase in cadmium excretion was observed and detoxification continued for another six months.
5. LRA by ELISA/ACT tests revealed loss of reactivity to gluten and sulfite. Continued reactivity to propyl gallate was observed. On investigation, certain personal care products containing propyl gallate were found and discontinued; products not containing this chemical were substituted.

Continued on page 88 ▶
# Food & Chemical Effects on Acid / Alkaline Body Chemical Balance

<table>
<thead>
<tr>
<th>Acid Alkaline</th>
<th>Neutral Alkaline</th>
<th>Basic Alkaline</th>
<th>Food Deficiency</th>
<th>Leaned Acid</th>
<th>Leaned Alkaline</th>
<th>Basic Acid</th>
<th>Black Acid</th>
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<tbody>
<tr>
<td>Baking Soda</td>
<td>Baking Soda</td>
<td>Baking Soda</td>
<td>Spaghetti</td>
<td>Curry</td>
<td>Valerian</td>
<td>Niacin</td>
<td>Pantothenic Acid</td>
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### Table 3: Chemicals and Alkaline Food Recommendations

Prepared by Dr. Samuel Adams, Boston, MA. This image is a visual representation of a table showing the effects of chemical substances on acid and alkaline body chemistry. It recommends the use of food items to balance chemical imbalances. The table includes columns for Acid Alkaline, Neutral Alkaline, Basic Alkaline, Food Deficiency, Leaned Acid, Leaned Alkaline, Basic Acid, and Black Acid. Each food item is listed along with its corresponding alkaline or acid effect, facilitating a balanced diet approach.
Functiona Lab Tests

- WC reported that he had lost 19 pounds without caloric restriction. He also reported himself to be more at ease and less reactive to stressful situations. Overall, he reported that he felt 10-15 years younger and was able to exercise more "because I feel so much better."

Conclusion

Each person has a specific set of conditions and requires nutrients at dosages to best meet their individual utilization rates or half-lives. The information above provides functional, state-of-the-art methods for determining individual needs based on causes rather than consequences. This makes it possible for people to take a more active role in their health and have actionable information available to them, particularly with the experience and interpretation provided by knowledgeable health professionals. We can now use integrative medical approaches based on global evidence databases and clinical experience as detailed in this article. This article is dedicated to those who want to live well and happily.

Resources

LRA by ELISA/ACT® tests are available from ELISA/ACT Biotechnologies, LLC 46161 Westlake Drive, #300A, Sterling, Virginia 20165 800-553-5472; Fax: 703-450-2981 clientservices@ELISAACT.com | www.ELISAACT.com

MELISA Medica – Prof. Vera Stejskal August Wahlstöms väg 10 182 31 Danderyd, Sweden Phone & fax: +46 8753 2322 contact@melisa.org

The Health Studies Collegium Alkaline Way™ Guide is available in print and digital versions. Contact: 2 Pidgeon Hill Drive, #410; Sterling, Virginia 20165 800-326-7372; Fax: 703-450-2997 PERQUE® Supplements are available from PERQUE, LLC 14 Pidgeon Hill, #180; Sterling, Virginia 20165 800-525-7372; Fax: 703-450-2995 clientservices@PERQUE.com | www.PERQUE.com

Kennedy-Krieger Lab of Johns Hopkins University 707 North Broadway, Baltimore, Maryland 21205 443-923-9200; 800-873-3377 info@kennedykrieger.org | www.kennedykrieger.org

Notes

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21. 1st morning urine pH after rest. PERQUE, LLC, Sterling, VA 20165.
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Dr. Jaffe is Senior Fellow of the Health Studies Collegium research foundation. He is the developer of the LRA by ELISA/ACT tests and plans, the d-phenylalanine nutritional and toxic mineral assessment protocol, the ascorbate calibration protocol, dose-response platelet aggregation, an occult blood method not interfered with by ascorbate reducing substances, among other contributions to biomedical science. He serves as director of ELISA/ACT Biotechnologies, LLC and PERQUE, LLC, nutritive supplements.

Dr. Jaffe is recipient of the International Scientist of the Year 2003, awarded by the International Biographical Commission of Cambridge, England, to recognize his contributions to Biochemistry, Clinical Medicine, and Immunomics. He was recently elected as a Fellow of the National Academy of Clinical Biochemistry. He also maintains Fellow status in the American Society for Clinical Pathology, American College of Nutrition, and American College for Allergy, Asthma, and Immunology. He is a certified clinical nutritionist (CCN).
Figure 1: Influence of Choline Cirate on Ionized Magnesium Uptake

Figure 2: Functional Lymphocyte Response assays (LRA) Are Able to Measure All Delayed Allergy Responses

Figure 3: Individual Ascorbate Need Based on Calibration

Figure 4: Effect on Mean Cortisol Values for Complete Group

Figure 5: “DG”: Improvement in Better Insulin Function with Improved HPA Axis
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  - Chronic fatigue (CFIDS), migraines,
  - Chronic sinusitis, joint pain, refractory weight, and more

- Ex vivo functional blood test for delayed allergies for the most accurate results

- Comprehensive testing for 450-plus items:
  - Foods, additives & preservatives, environmental chemicals, toxic minerals, molds,
    medications, food colorings, and more

- The only lab that tests for all three delayed allergy pathways

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