**Nutrition In HIV and Aging**

- The Cretan-Mediterranean and D.A.S.H. diets have the best data on supporting healthy aging and reducing risk of heart disease, diabetes and cancer.
- HIV infection is a chronic inflammatory condition, further stressing the already weakening antioxidant capacity that accompanies aging. Dietary protein, trace minerals, and antioxidant nutrients act to slow the rate of aging, and can help prevent frailty.
- Even in the HAART era, nutrient deficits for zinc, selenium, vitamin D, and others affect morbidity and mortality.

**Chronic Infection Burdens** repair and immune functions that are already slowing as a result of aging. Particularly important is the age-related shift in glutathione status, leaving a more pro-oxidant state in cells [1]. The slower protein assembly of aging plays out as impaired muscle, organ, and bone repair. Impaired protein assembly yields “immune senescence”—an inability to activate naïve T cells and generate memory T cells. Immune cell activity is sensitive to nutrition deficits; HIV infection alters gut cell structure, impeding all nutrient absorption, even in the HAART era [2].

**A Guide to Groceries for Routine Cuisine**

Nutrition is about providing materials for the formation, operation, and repair of cells. The Mediterranean Diet, or Cretan-Mediterranean Diet, is the food plan with the best data on both immune (anticancer) and cardiac benefits [3]. The D.A.S.H. Diet preserves cardiac health, and reduces the risk of developing diabetes [4].

Plant-based vegetarian diets seem to reduce disease risks, but this is epidemiological data that does not incorporate HIV disease elements such as fibroed intestinal mucosa, altered gut-associated lymphoid tissue (GALT) status, and the redox burden of chronic infection as operative factors in assessing outcomes.

In directing people toward a Cretan-Mediterranean diet, one must consider some key elements. The diet has more fish and seafood, and less meat than other diets. There are liberal amounts of fruit and vegetables, including many wild greens. Whole grains are eaten as cereals and sourdough bread, not as pasta. Legumes, rich in magnesium, are eaten almost daily. Fat sources are nuts, olives, and olive oil. Dairy is more cheese than milk, especially goat and sheep milk cheeses. Chemically, the diet contains more selenium and glutathione, plus a healthier balance of omega-6 to omega-3 fats. It is very high in fiber and rich in antioxidants like vitamins C and E, plus resveratrol from red grapes/wine, and the anti-inflammatory oleuropein from olive oil. One research article reported that people on the island of Crete seem to consume 245 kilograms of plant material per year, (compared to the 150 kg in Italy and France, and 90 in Finland)[5].

**Advice for Assembling a Healthy Diet in HIV and Aging**

**Assemble the Daily Diet in a Series of Five Steps.**

**Step 1.** Determine desirable protein foods, and eat them three times a day—generally breakfast, lunch, and dinner. Research is showing that aging people need more protein, up to double the RDA [6]. Loss of muscle in
aging, known as sarcopenia, is a much bigger problem than in the general population and medical needs to be appreciated [7].

The American Heart Association stresses two 4-ounce servings per week of oily fish. As approximately 50% of Americans consume no fish each week, a daily fish-oil pill supplement should be considered. An average fish-oil pill will usually have 180 mg of DHA, the amount needed to replicate the 50% reduction in risk of senile dementia reported in Framingham studies. Up to 6 grams a day of fish oils have lowered triglyceride levels by almost 40% in an HIV population [8].

As a matter of practicality, whey protein powder is a convenient and inexpensive additive to a meal, often added to breakfast cereal or protein-fruit smoothies. Trials of whey protein use in HIV populations have shown that it can sometimes raise CD4 counts [9] and frequently reverses glutathione (antioxidant enzyme) deficiency [10]. Whey can also improve osteoblast activity in bones [11]. Consumed dairy products should be fat-free or low-fat.

**Step 2.** Urge the eating of vegetables at both lunch and dinner. Three cups a day would be just a minimum amount to eat for the sake of obtaining Cretan-diet levels of minerals and phytochemicals. HIV-infected people consuming a dietary pattern that included higher intake of vegetables, fruits, and low-fat dairy foods, have significantly higher CD4 counts [12].

**Step 3.** Encourage eating fruit three times per day to improve glutathione and glutathione peroxidase levels [13]. Eating fruit, including the traditional “apple-a-day,” provides the water-soluble fiber pectin, supporting beneficial gut flora, which lower cholesterol numbers, C-reactive protein levels, and body percent fat [14, 15].

**Step 4.** Nuts and seeds contain essential oils that form cell membranes. A target is eating one handful of nuts and one of seeds every day. A trial of a Mediterranean Diet, supplemented with mixed nuts, proved more useful in heart disease prevention than did a low-fat diet [16]. The fatty acid gamma linolenic acid (GLA), prominent in seeds (and spinach), lowers LDL-cholesterol, raises HDL-cholesterol [17] and lowers blood pressure [18]. Low GLA levels seem to be a risk factor for development of type2 diabetes [19]. Dry skin is a sign of low GLA levels. Consuming ¼ cup raw seeds daily, or taking 2 grams evening primrose oil covers GLA needs. People with a GLA deficiency gain fat in the abdomen, see cholesterol and triglyceride counts rise and HDL-cholesterol levels drop [20] precisely the common body shape and blood lipid changes seen in lipodystrophy.

**Step 5.** Starches (carbohydrates) are the remaining part of fuel and food needs. Legumes, technically a protein-rich starch, are an important component of the Mediterranean diet, providing fiber, plant protein, and magnesium. Higher magnesium intake is inversely related to cardiac and cancer mortality [21]. In both the D.A.S.H. Diet and Mediterranean Diet, higher magnesium intake is correlated with preservation of cognitive function in aging [22]. Select starch portion sizes wisely in aging; oversized servings of starches tend to turn to fat faster than smaller amounts [23]. At least half of grains consumed should be whole grains.

In addition to assembling a diet that focuses on variety, nutrient density, and amounts, the calories from added sugars and saturated fats, along with sodium should be limited [24].

**Nutrition for Accentuated Aging with HIV**

Insufficient antioxidant activity coupled with mitochondrial damage underlie the faster rates of deterioration occurring in this population. Common concerns are osteoporosis, vascular disease risk, sarcopenia, loss of cognitive function, fatigue/frailty, and immune senescence.
Subtle nutrient deficiencies play a role in all of these problems. Using comprehensive nutrition therapy to treat degenerative processes offers the opportunity to avoid increased pharmacologic burden in a population where side effects are especially likely.

In the internet age, many consumers are familiar with nutritional supplements in HIV treatment. Below is a review of conditions and studies that could improve clinicians' comfort level with the vitamin, mineral, and other supplement interventions their HIV-infected patients are utilizing. Nutrition therapy can help in situations where treatments are nonexistent or have low efficacy.

**Heart and Vascular Disease Risk**

Cholesterol levels do not account for all cardiac and vascular disease risk. Carotid artery occlusion is associated with longer time on HAART. Subtle B-vitamin deficiencies, seen as higher homocysteine levels, were a cause of carotid artery narrowing in the Framingham study [25]. B–vitamin–dependent enzymatic deficiencies in the elderly cannot be detected in serum B-vitamin-level tests. This speaks to the utility of supplementing with B-complex vitamins in this population.

As stated above, the American Heart Association recommends eating fish twice a week in general, and consuming 1 gram a day of EPA/DHA for people with heart disease. Low HDL is common in this population. This can be reflective of essential fat deficiency, and of lower redox capacity. In HIV-uninfected people, N-acetylcysteine at 1200mg to 3600mg/day range can raise HDL cholesterol by 10 points [26]. Improving HDL level is an important marker for reducing risk from cardiac events even into a patient’s 80s. The amino acid L-Glutamine, along with EPA/DHA fatty acids, improves exercise capacity in patients with heart failure [27].

**Osteoporosis**

Chronic inflammation along with some HAART initiates systemic bone loss. Vitamin D and calcium supplements are generally not enough to reverse thinning bones. Newer research, using an algae-derived calcium, with strontium, boron, magnesium, plus vitamins D and K2 supplements, is reversing osteoporosis in just 6 to 12 months in older people [28]. Safety measures to reduce falls at home and increased fitness activity can lower fracture rates [29].

**Immune Reconstitution**

Many older people come late to care, with very low CD4 counts. Adequate glutathione levels are necessary for generating T cells. Supplementing N-acetylcysteine at 1 to 2 grams per day, or L-glutamine at 5 to 10 grams per day, is helpful for this. A B-complex 25 with vitamin C pill improves T-cell numbers in HIV disease [30] Use of protease inhibitor therapy puts people at risk for low vitamin B12 levels [31] as does taking proton pump inhibitors [32]. A multivitamin improves T-cell and NK-cell counts and reduces sick days in the elderly.[33,34] Vitamin E at 200 units improves immune responses to vaccines.[35] Co-enzyme Q10 reverses lymphadenopathy and improves immune function [36]. It protects endothelium in people with diabetes [37].

**Sarcopenia/Fatigue/Frailty**

From a nutrition perspective, frailty is simply failure to achieve adequate repair of many cell and organ systems. L-glutamine plus antioxidant vitamin supplementation reverses HIV wasting [38]. Glutamine alone raises both glutathione and mood levels [39]. L-carnitine supplements reverse both neuropathy symptoms [40] and lipodystrophy problems [41]. At 2 grams per day it has improved muscle action in heart failure trials [42]. Coenzyme Q10 can increase ejection fractions in seniors, improving constitutional energy levels [43].

**The Bottom Line**
Patients need to be reminded to emphasize lifestyle factors such as food, nutrition, and fitness to maintain their health and improve their quality of life while aging with HIV.

- Food and fitness education can reduce all-cause mortality in an at-risk dyslipidemic population by 75% over two decades [44]
- Being infected with HIV acts both separately and synergistically with usual brain aging to cause neuronal changes [45]
- The Mediterranean Diet, coupled with routine exercise, lowers risk of Alzheimer’s more than either diet or exercise alone [46,47]
- Multivitamin supplements can positively affect immune cell behaviors and telomere length.

*Updated on February, 2016 by Charlie Smigelski, B.A., B.S., R.D., Infectious Disease Program, Lynn Community Health Center, Lynn, MA*

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