The role of nutrition in endocrine related disorders such as metabolic syndrome and diabetes has been clearly established. Chronic diseases such as metabolic syndrome and diabetes may share similar underlying mechanisms with other inflammatory related diseases. Indeed, there is increasing evidence that metabolic syndrome and diabetes are associated with increased risk of cognitive decline such as dementia and Alzheimer’s disease attributed to cerebrovascular disease.1-10 This neuroendocrine connection has gained significant attention as research continues to uncover the relationship between dementia and diabetes. I believe research in this area is highly warranted as the emotional and financial burden of dementia and Alzheimer’s disease (AD) on society is documented to increase in the next decades.11 In a very recent systematic review of prospective trials that looked at the risk of Alzheimer’s disease in individuals with diabetes, authors found a statistically significant relationship between individuals with mild glycemic dysregulation such as metabolic syndrome and a high proportion of diagnoses of Alzheimer’s disease verified by autopsy or magnetic resonance imaging.10 Molecular Mechanisms – What are the potential molecular and biochemical mechanisms that explain the participation of these metabolic disorders in the pathogenesis of Alzheimer’s disease? Consider that the human brain uses glucose as a primary fuel; insulin secreted by the pancreas crosses the blood-brain barrier (BBB), reaching neurons and glial cells (glial cells are non-neuronal “immune cells of the brain” that provide support and nutrition, maintain homeostasis, form myelin, and participate in signal transmission in the nervous system), and exerts a region-specific effect on glucose metabolism.12,13 Taken together, it appears that insulin modulates cognition and other aspects of normal brain function. Glucose homeostasis is critical for energy generation, neuronal maintenance, neurogenesis, neurotransmitter regulation, cell survival and synaptic plasticity.13 It also plays a key role in cognitive function. In an insulin resistant condition, there is a reduced sensitivity to insulin resulting in hyperinsulinemia. This condition persists for several years before becoming full blown diabetes. Toxic levels of insulin negatively influence neuronal function and survival, and increased peripheral insulin concentration acutely raises its cerebrospinal fluid concentration.13 Peripheral hyperinsulinemia then leads to cellular cascades that trigger neurodegeneration and decline in cognitive function. When hyperinsulinemia is occurring peripherally and is chronic, there is less insulin available to be transported across the BBB. As a result, there is reduced insulin signaling in the brain and an alteration of insulin’s actions, including its anti-apoptotic effect.13 Simply put, insulin resistance is characterized by chronic peripheral insulin elevations, and it is accompanied by reduced brain insulin levels and insulin activity. However, the increase in brain insulin levels resulting from its peripheral administration at optimal doses has shown a cognition-enhancing effect in patients with Alzheimer’s disease.13 Age Matters - What about age of onset of diabetes? Does the risk of Alzheimer’s disease and vascular dementia increase when diabetes
occurs early in life as compared to later life? According to Margaret Gatz, PhD, a professor of psychology, gerontology and preventive medicine at the University of Southern California, and her team who tracked rates of dementia and diabetes in Swedish twins, developing diabetes before the age of 65 was associated with a 125% increased risk of subsequently developing Alzheimer’s disease. Their research was the outcome of recent studies that have linked vascular risk factors to an increasing risk of vascular dementia and Alzheimer’s disease. They decided to focus on diabetes because vascular risk factors associated with the disease are potentially modifiable by changing health behavior. The researchers found that diabetes was a risk factor for both vascular dementia and for Alzheimer’s disease, although the association was more robust for vascular dementia than for Alzheimer’s disease. They also discovered that diabetes that first occurred before age 65 was a far more important risk factor for dementia than diabetes that did not occur until after age 65. They surmised that although diabetes could be a possible cause of dementia, it is also likely that diabetes and dementia each arise from the same environmental exposures and influences. They concluded that a complex interplay of genetic factors and environmental exposures throughout the entire life course likely affects risk of dementia in old age. Research results also suggested that age of diabetes onset, rather than how prolonged diabetes treatment had been, might be an important factor in later dementia risk.

As a result, if the metabolic syndrome and diabetes is associated with increased risk of developing cognitive impairment, particularly if diagnosed earlier in life, then early identification and treatment of these individuals can offer more avenues for disease course modification.

**Nutrition, Inflammation and Cognitive Function** - Inflammation, particularly low-grade chronic inflammation, appears to affect several brain functions, from early brain development to the development of neurodegenerative disorders and perhaps some psychiatric diseases. On the other hand, nutrition and dietary components and patterns have a plethora of anti- and pro-inflammatory effects that could be linked to cognitive function. Even a modest effect of nutrition on cognitive decline could have significant implications for public health. Controlled studies with mice have demonstrated that cognitive performance is subject to dietary compromise and that key dietary supplementation (such as anti-inflammatory polyphenols found in fruits, vegetables and legumes) can alleviate and in some cases reverse the impact of dietary deficiencies on cognitive performance. This suggests the potential importance of early nutritional intervention, including preventative approaches before definitive diagnosis. The beneficial effects of nutritional supplementation are supported by a number of preclinical and clinical studies. Ultimately, it is becoming increasingly clear that a dietary pattern rich in nutrients with favorable anti-inflammatory properties and low in proinflammatory nutrients protects against inflammatory chronic diseases and neurodegenerative disorders. It appears that more important than single nutrients or any specific phytochemicals are the foods that are eaten and the dietary and lifestyle pattern as a whole.

As with any other organ, the brain needs nutrients to build and maintain its structure, both to function harmoniously and to be protected from diseases or premature aging. However, for many years it was not fully accepted that food can have an influence on brain structure and thus on its functions, including cognitive, intellectual, and mental. Most micronutrients (vitamins, minerals, essential amino acids, and essential fatty acids, including omega-3 polyunsaturated fatty acids) have been directly evaluated with regard to cerebral functioning. In fact, the full genetic potential of a child for physical growth and mental development may be compromised in the presence of dietary deficiencies (even subclinical). Children and adolescents with poor nutritional status are prone to alterations of mental and behavioral functions that can, to a certain extent, be corrected by dietary measures. Indeed, nutrient composition and meal pattern can exert either immediate or long term effects, beneficial or adverse. Of interest when proposing the possible role of anti-inflammatory components in the diet for the prevention of Alzheimer’s disease is the fact that the risk of developing Alzheimer’s disease is reduced by antioxidants and by nonsteroidal anti-inflammatory drugs. In epidemiological studies of human populations and experiments in animal models of neurodegenerative disorders, the wide variety of natural antioxidants found in plant foods possess neuroprotective as well as cardioprotective and chemoprotective properties. It has been hypothesized that a combination of multiple nutritional additives may be able to provide neuroprotection. In a study that looked at dietary supplementation with a combination of α-lipoic acid (ALA), acetyl-L-carnitine (ALCAR), glycerophosphocholine (GPC), docosahexaenoic acid (DHA), and phosphatidylserine (PS) the authors conclude: “We demonstrate herein that dietary supplementation with a mixture of ALA, ALCAR, GPC, DHA, and PS reduced reactive oxygen species in normal mice by 57% and prevented the increase in reactive oxygen species normally observed in mice lacking murine ApoE when maintained on a vitamin-free, iron-enriched, oxidative challenge diet. We further demonstrate that supplementation with these agents prevented the marked cognitive decline otherwise observed in normal mice maintained on this challenge diet.”

**Berries and Beyond** - Many papers have been published reporting the neuroprotective effects of fruits (especially berry fruits), vegetables, and grains, which are rich sources of antioxidant compounds and phytochemicals, including α-tocopherol, vitamin E, selenium, lycopene, resveratrol, and...
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Ginsenosides The neuroprotective effects of various phytochemicals are most probably from their ability to reduce oxidative stress levels. Notable among these are resveratrol from red wine, the green tea catechins, and the turmeric extract curcumin, which have been intensively studied for their potential to prevent or treat disease and are worthy of consideration in relation to Alzheimer’s disease. The therapeutic effects of berry supplementation on age-related motor and cognitive decline have been consistently reported in animal studies. In terms of total antioxidant capacity, berries such as blueberries, strawberries, cherries, and acai berries all exhibit strong oxygen radical quenching abilities. These fruits are known for their bright, deep colors, attributed to the presence of polyphenolic phytochemicals in the skins and meat of the fruit. Polyphenols can be subdivided into many classes including flavonoids, phenolic acids, stilbenes, and lignans. Of particular interest are the flavonoid anthocyanins, which impart red and blue colors to berries, grapes, and red wine. The majority of the evidence indicates that dietary polyphenols do accumulate in the brain, but only after long-term consumption. This accumulation of polyphenols in neural tissue suggests that they may act directly within brain areas responsible for modulating cognitive processes. Although clinical studies on cognitive impairment and specific berry supplementation have yet to be completed, a number of studies have indicated that inclusion of antioxidant-rich foods in the diet can improve cognitive functioning in humans. In elderly persons without dementia, elevated dietary intake of flavonoid-rich foods was associated with better cognitive function. Additionally, high flavonoid consumption was associated with attenuation of cognitive decline over a period of 10 years. Other studies have revealed that general dietary patterns, such as daily fruit and vegetable consumption and adherence to a “Mediterranean diet” emphasizing vegetables, fruits, beans and nuts, can decrease the risk of developing dementia in aging humans. Greater adherence to the Mediterranean diet has been associated with a lower risk of developing Alzheimer’s disease and with reducing mortality in Alzheimer’s disease. The Mediterranean diet is a composite of dietary antioxidant and dietary anti-inflammatory compounds, and this could, at least partially, explain the association with these outcomes. Another possible mechanism is that the Mediterranean diet may be exerting its protective effect against Alzheimer’s disease through cardiovascular cerebrovascular mechanisms and hence lower disease risk. It is important to note that it is not only dietary changes that may be important in reducing risk and consequences of disease. Avoiding chronic stress situations and increasing physical activity and exercise (including mental exercise) are also important and can modify the course of cognitive decline and delay mortality. Epidemiological evidence indicates that increased inflammation, and in particular C-reactive protein (CRP) concentrations, are associated with neurodegenerative disorders and perhaps also some psychiatric diseases as well as indices of metabolic and cardiovascular health. Nevertheless, proof of causality can only be established by showing that lowering inflammatory markers can prevent these problems. Although a healthy dietary pattern significantly correlates with lower CRP concentrations, the question of whether a direct CRP-lowering effect from such preventive measures can prevent stroke, cognitive decline, or depression can only be answered if the study is multidisciplinary in design.

The Vitamin D-Dementia Connection - Recent insights suggest that vitamin D may have neuroprotective benefits and could be important for preserving cognitive functions via several different mechanisms that are beyond the scope of this paper. However, one mechanism that has been consistently reported is the positive effect of 1,25-dihydroxy vitamin D on the acetylcholine pathway. Apparently, 1,25-dihydroxy vitamin D treatment increases choline acetyltransferase activity in the rat brain nuclei and this has been associated with improved cognition. Additionally, in a cross-sectional study done by Oudshorn et al, a positive association between serum 25-hydroxy Vitamin D levels and MMSE scores was observed. (MMSE, which stands for Mini Mental State Examination, is a brief 30-point questionnaire test that is used to screen for cognitive impairment). Specifically, vitamin D sufficient patients had significantly higher MMSE scores as compared to vitamin D insufficient ones. One mechanism that I did not see discussed in the literature but I believe to be a plausible explanation begins with the fact that vitamin D has been associated with insulin resistance and the down regulation of pro-inflammatory cytokines such as TNF-alpha and IL-6. Insulin resistance and inflammation, in turn, has been associated with cognitive decline as discussed earlier. Therefore, it may be possible that vitamin D could be considered a positive neuroendocrine modulator in the prevention and even treatment of cognitive decline and other related neurodegenerative chronic disorders. Clearly, an association between low vitamin D status and cognitive impairment does not establish that vitamin D inadequacy causes cognitive deterioration. However, vitamin D inadequacy does appear to be an unappreciated contributor to cognitive decline. As a result, simple supplementation to assure adequate circulating levels of this vitamin could potentially benefit many patients presenting with memory loss. Furthermore, if vitamin D supplementation is found to be of benefit for Alzheimer’s disease and/or other neurodegenerative disorders, it raises the possibility that this approach could be an inexpensive, safe modality to be utilized in the prevention of these processes. Ultimately, what is clear is that insulin impairment happens early in cognitive...
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...decline. The World Health Organization predicts that by the year 2020, the number of people with dementia will grow to 19 million worldwide. It has been shown to be linked to major neurotransmitters responsible for cognition, poor energy metabolism, and abnormalities that contribute to the tangles characteristic of advanced Alzheimer's disease, now also known as "Type 3 diabetes" that characterizes "Alzheimer’s type neurodegeneration." The apparent convergence of the disciplines of nutrition, inflammation, and neurology/psychology urgently show the need for greater research collaboration and cross-disciplinary exchange of ideas if we are to understand the common mechanisms underlying chronic disease as well as to propose methods for their prevention or treatment.

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References

Diet, Dementia and Diabetes


Functional Foods and Dietary Management of LDL Cholesterol

Janet Bond Brill, PhD, RD

This article reviews the safety, effectiveness, and proposed mechanisms of action of four functional foods with the most robust evidence of their effects in reducing low-density lipoprotein cholesterol (LDL-C). Dietetics professionals should consider prescribing functional foods as an adjunct to a heart-healthy diet for optimal dietary management of LDL-C and for improving cardiovascular disease (CVD) risk.

Support of Cholesterol-Lowering Functional Foods

Government and health organizations have shown support for cholesterol-lowering functional foods (FFs) as an adjunct to a heart-healthy diet for optimal dietary treatment and management of elevated LDL-C (the primary target of therapy for primary and secondary prevention of CVD events). The National Cholesterol Education Program Adult Treatment Panel III (ATP III) recommends therapeutic lifestyle changes (TLC) as the first line of therapy for hypercholesterolemia. The TLC program advocates a combination of several FFs, such as viscous soluble fiber (VSF) and plant sterols/stanols (PS), to enhance the effectiveness of its prescribed diet. Maximal application of TLC therapy can result in estimated LDL-C reductions of 25% to 30%. This substantial decrease obtained through lifestyle therapy is extremely valuable considering that an approximate 1% reduction in LDL-C is associated with a 1% to 3% decrease in CVD risk. Thus, FFs applied with a diet low in saturated fat and cholesterol have proven to be effective in maximizing LDL-C reduction in patients with hypercholesterolemia.

The American Heart Association also recommends FFs to enhance the effectiveness of its dietary guidelines. The U.S. Food and Drug Administration (FDA) has issued health claims for several FFs (phytosterols, VSF, soy protein [SP], and tree nuts), stating that each can reduce CVD risk when consumed as part of a diet low in saturated fat and cholesterol.

The four functional food categories with the greatest scientific support for their safety and efficacy in reducing LDL-C are plant sterols, viscous soluble fiber, soy protein, and tree nuts.

Plant Sterols

The cholesterol-lowering effect of PS has been documented extensively in the literature since the 1950s. A meta-analysis of 41 clinical trials indicates that 2 g/day of sterols or stanols reduced LDL-C by 10%. ATP III recommends a dietary intake of 2 g/day of PS as an adjunct to a diet low in saturated fat and cholesterol for better prevention of CVD. The exact mechanism responsible for the LDL-C reduction associated with PS consumption is not yet fully elucidated. PS exert their cholesterol-lowering effects through interference of dietary and biliary cholesterol uptake from the intestinal tract via micellar absorption. PS are structurally similar to cholesterol and compete for incorporation into the limited spaces in the mixed micelles in the intestinal lumen. Micellar competition results in decreased enteroocyte cholesterol absorption and increased fecal excretion. PS also increase gene expression of ATP-binding cassette (ABC) transporter genes, which direct the production of transport proteins that regulate cholesterol’s efflux from the enterocytes back into the intestinal lumen.

Some concern exists over the potential for reduced absorption of certain fat-soluble vitamins, most notably tocopherols and carotenoids. However, consumption of the recommended ≥5 daily servings of fruits and vegetables has been shown to offset this potential side effect. PS are considered safe and effective and are listed on the FDA generally recognized as safe (GRAS) list.

Viscous Soluble Fiber Foods

There are four major types of VSF: 1) β-glucan (found in cereals, particularly oatmeal and barley); 2) psyllium (consumed in dietary supplement form); 3) gums (found in legumes); and 4) pectin (found in fruits such as apples and pears). VSF consumption significantly lowers LDL-C (10%-15%) when added to a heart-healthy diet. The TLC program suggests 5 g/day to 10 g/day VSF, with the goal of 10 g/day to 25 g/day for maximum LDL-C lowering benefits. (The estimated average soluble fiber intake in the United States is 3-4 g/day.) The FDA permits health claims on food products containing β-glucan and psyllium (two of the four major categories of VSF).

VSFs are polysaccharides that thicken and form a gel when mixed with fluids. The literature proposes several mechanisms of action for the cholesterol-lowering effect associated with VSF consumption, with the action purportedly occurring primarily in the gastrointestinal tract. The common underlying mechanism is the ability of VSFs to increase elimination of bile acids. Interruption of enterohepatic circulation produces a deficit in bile acid return, stimulating hepatic conversion of cholesterol to new bile acids. This is evident by the increased activity of 7 α-hydroxylase. Ultimately, this sequence of events increases hepatic uptake of circulating LDL-C and a subsequent reduction in serum LDL-C level.

- β-glucan. Oatmeal and barley are rich sources of the VSF β-glucan, which has been shown to significantly lower LDL-C. The cholesterol-lowering effect of consuming oats in particular is well-documented. In 1997, following an extensive literature review, the FDA approved the oat health claim for prevention of CVD. Andon and Anderson recently reaffirmed the FDA’s conclusion that consumption of oats and oat-based products significantly reduces blood cholesterol concentrations. Human clinical trials also have...
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demonstrated that using barley as the food source of β-glucan is equally effective in lowering LDL-C. The FDA health claim for soluble fiber specifies a serving size of at least 3 g/day of β-glucan soluble fiber from either whole oats or barley, or a combination of both whole oats and barley as part of a diet low in saturated fat and cholesterol, to potentially reduce heart disease risk.

- Psyllium. Psyllium is a gelatinous substance derived from the Plantago ovata plant. The husk of the psyllium seed is a rich source of the VSF psyllium hydrophilic mucilloid. Psyllium has an excellent safety record and has attained FDA GRAS status as a food substance. It is one of the most effective LDL-C-lowering VFSSs, with the fewest adverse effects. A meta-analysis of 8 clinical studies on the hypocholesterolemic effect of psyllium adjunctive to a low-fat diet showed that 10.2 g/day psyllium (~7 g VSF) was well-tolerated and resulted in a 7% mean reduction in LDL-C. The FDA health claim for foods containing soluble fiber from psyllium seed husk was based on a large body of research using this quantity of psyllium; hence, the health claim specifies 7 g/day or more of VSF from psyllium seed husk.

Soy Protein

The cholesterol-lowering effects of SP have been documented for some time now, with a 1995 meta-analysis of 38 studies concluding that ingestion of 47 g/day of SP reduces LDL-C by an average of 12.9%. However, a recent AHA meta-analysis revealed a much more modest reduction in LDL-C (~3%). The cholesterol-reduction mechanism may be related to one or both of the major groups of bioactive components in soy: SP and soy isoflavones (SI). With regard to SP, the α’ subunit of the 7S fraction of a major soy storage protein, beta-conglycinin, is postulated to upregulate hepatic LDL receptors. Regarding SI, a meta-analysis of 11 clinical trials showed that consumption of SP with a higher content of isoflavones decreased LDL-C significantly more compared with consumption of the same SP amount low in isoflavones. Hence, ingesting 102 mg/day SI (the amount in 2 glasses of soymilk) reduced LDL-C by 3.8%, independent of the amount of SP consumed. Note that the mild LDL-C reduction observed with frequent SP consumption also may be the result of simply displacing some cholesterol-raising animal fats in the diet with SP.

The FDA health claim for SP specifies 25 g/day as part of a diet low in saturated fat and cholesterol to potentially reduce the risk of heart disease.

Tree Nuts

Pooled analyses of clinical human nutrition studies show that adding a variety of tree nuts to a healthy diet reduces LDL-C by 3% to 19% compared with either a low-fat or Western diet. Although the exact mechanism of action for reducing LDL-C is not fully established, it has been proposed that it relates primarily to the favorable fatty acid profile of nuts (most are low in saturated fat, some are high in monounsaturated fatty acids, and others contain a considerable amount of omega-3 and omega-6 polyunsaturated fatty acids). Moreover, nuts contain a substantial amount of dietary fiber in addition to numerous bioactive components (antioxidants, vitamins, minerals, PS, and polyphenols) that would favorably affect the lipid profile.

The FDA has granted a qualified health claim for most tree nuts and peanuts, specifying a serving size of 1.5 oz/day as part of a diet low in saturated fat and cholesterol to potentially reduce heart disease risk.

Dietary Combination Therapy

To achieve maximum reduction of LDL-C by dietary means, a multicomponent diet is the best strategy and is comparable to low-dose statin therapy in the potential magnitude of LDL reduction that can be achieved. Daily consumption of a combination of functional ingredients rather than a single FF has been shown to be more effective in lowering LDL-C. For example, research on the effects of combining psyllium with PS revealed a significant 10% reduction in LDL-C, whereas each individual food had previously been shown to contribute only a 4% to 7% reduction in LDL-C. Thus, the investigators propose that an additive effect in LDL-C reduction occurs when FFs are combined.

- Functional foods in a dietary “portfolio.” Jenkins et al were the first to introduce this novel dietary strategy for reducing LDL-C. Termed the “portfolio diet,” a collection of FFs (almonds: 23 g/1,000 kcals; soy protein: 22.5 g/1,000 kcals; VSF: 10 g/1,000 kcals; and PS: 1 g/1,000 kcals), all consumed with a diet low in saturated fat and cholesterol, showed dramatic LDL-C reductions comparable to that achieved with first-generation statin medication. Thus, a combination of FFs and a heart-healthy diet may provide an effective therapeutic alternative to drug therapy for some patients.

- Functional foods in combination with statin medication. Additional research reveals that combining FFs with low-dose statin therapy can achieve a reduction in LDL-C comparable to that achieved with higher dosages of statins taken alone. Psyllium supplements (18 g Metamucil® 5.1 g VSF) 3 times/day with meals) in combination with 10 mg simvastatin over 8 weeks reduced LDL-C to the same degree as 20 mg simvastatin. Simons demonstrated that combining a statin with PS produces a purely additive effect on LDL-C reduction equivalent to doubling the statin dosage. Hence, FFs exert additive effects in combination with statin therapy and can be a safe and effective strategy for magnifying medicinal LDL-C.
reduction. Furthermore, adjunctive FFs can help patients achieve their LDL-C goals using lower dosages of statins, thereby decreasing the potential risk of pharmacotherapy adverse effects.

**Conclusion and Practical Applications**

The preponderance of scientific evidence to date strongly supports the substantial potential of incorporating an array of FFs into the daily diet as an inexpensive, safe, and effective means to augment the cholesterol-lowering effect of standard dietary treatment to prevent CVD. Combining FFs either alone or as an adjunct to statin pharmacotherapy exerts an additive effect, magnifying the total LDL-C reduction—clearly a beneficial outcome for CVD risk management. Dietetics professionals should consider recommending a range of FFs in combination and as an adjunct to a heart-healthy diet to enhance the effectiveness of standard dietary management of hypercholesterolemia.

Janet Bond Brill, PhD RD, is an author, consultant, and media spokesperson and lectures widely on nutrition for hypercholesterolemia. She is the author of “Cholesterol DOWN—10 simple steps to lower your cholesterol in 4 weeks without prescription drugs” (Three Rivers Press).

**References**


Key cholesterol-lowering functional foods

High cholesterol is a leading risk factor for heart disease. Keeping your cholesterol in check can help prevent heart disease. A healthy diet is the first step toward prevention, and adding a few cholesterol-lowering “functional foods” to a heart-healthy diet can help keep your cholesterol where it needs to be.

Functional foods are foods or dietary components that may provide a health benefit beyond basic nutrition. Key cholesterol-lowering functional foods include:

- Plant sterols and stanols. Plant sterols or “phytosterols,” found in plant foods, are sold as supplements or as an ingredient in various foods such as margarine, orange juice, and yogurt (look for “plant sterols and stanols” or “phytosterols” in the ingredient list). Up to 2 grams daily, preferably divided over 3 meals, is recommended to lower cholesterol.

- Viscous soluble fiber. Like a sponge, this special fiber soaks up water and cholesterol in the intestine and is then excreted. Consuming at least 5 to 10 grams daily is recommended. Two types of this fiber are available as functional foods:
  - β-glucan soluble fiber: aim for 3 grams daily from either whole oats or barley.
  - Psyllium seed husk: build up to 10.2 grams of psyllium husk (about 7 grams of fiber). Psyllium generally is consumed through a dietary supplement (about 2 tablespoons of Metamucil® powder).

- Soy protein. Soy beans are a highly nutritious vegetable source of plant protein, filled with fiber, vitamins, minerals, and essential omega-3 fat. Unlike animal sources of protein, soybeans have no cholesterol and very little cholesterol-raising saturated fat. Consume 25 grams daily for heart health.

- Tree nuts and peanuts. Nuts are packed with nutrients: fiber, vitamins, minerals, protein, and the “good” type of polyunsaturated fat. How much is enough to keep your cholesterol in check? Aim for 1½ ounces daily (about 1 large handful).

**Tips for including these functional foods into your day**

**Start at breakfast:**
Eat a bowl of whole grain oatmeal (β-glucan soluble fiber) made with 1 cup of light soy milk (soy protein); drink a glass of orange juice with added phytosterols.

**Have a heart-healthy handful if you’re on-the-go:**
Carry a packet of dry-roasted, unsalted almonds for a portable snack.

**Try a veggie burger instead of a regular burger for lunch:**
A soy-based veggie burger provides soy protein—about 10 grams—and by eating plant protein rather than animal protein you’ll reduce your intake of cholesterol-raising saturated fat and cholesterol.

**Enjoy a bowl of barley soup at dinner:**
Barley is another good source of β-glucan soluble fiber. Try this delicious heart-healthy whole grain in soups, salads, or as a side dish.

**Add a sweet treat for dessert:**
Metamucil® makes a tasty psyllium-containing wafer in various flavors. Try these cookies with a cup of tea for a cholesterol-lowering sweet treat.

**Take it slow**
Incorporating functional foods into a daily heart-healthy diet is an inexpensive, safe, and effective way to optimize your lifestyle management of heart disease risk. However, many of these foods are high in fiber and sometimes result in unpleasant gastrointestinal side effects if too much is taken, too soon. Therefore, start slowly and gradually increase your intake. If you’re taking prescription medications or have a chronic medical condition, be sure to ask your physician about potential drug-nutrient interactions.
New Research on Vitamin D and Cognition:
Low vitamin D levels found to be associated with risk of dementia risk and cognitive decline in older adults

Elizabeth Redmond, PhD MMSc RD LD

Results of a new analysis of data from the Third National Health and Nutrition Survey (NHANES III) show that vitamin D deficiency is associated with an increased risk for cognitive impairment in older Americans. Vitamin D crosses the blood-brain barrier and receptors for vitamin D are found across the brain. The study found that low levels of vitamin D negatively impact the brain. 1 The researchers looked at a total of 3325 adults aged 65 years or older who completed cognitive assessments and provided blood samples. Vitamin D levels were divided by cut points previously established for bone health, from severely deficient (<10 ng/mL or <25 nmol/L) to sufficient (>30 ng/mL or ≥75 nmol/L) for 25-hydroxy vitamin D. Those found to be severely deficient in vitamin D (<10 ng/mL) had a higher risk for cognitive decline compared with those with sufficient levels (>30 ng/mL). Some researchers, though, do not see vitamin D as a full answer, stating that low vitamin D levels may simply be a marker of overall poor health.

Additionally, a study conducted between 1998 and 2006 also found older people with lower blood levels of 25-hydroxyvitamin D to have problems with memory, learning and thinking. The study of 850 Italians aged 65 or older conducted by British, Italian and American investigators found that those who were severely vitamin D deficient (<10 ng/mL) were 60 percent more likely to experience substantial general cognitive decline and 31 percent more likely to experience problems with mental flexibility compared with those with sufficient levels (>30 ng/mL). The research team thought vitamin D may help prevent the degeneration of brain tissue by having a role in formation of nervous tissue, maintaining levels of calcium in the body, or clearing of beta-amyloid, the substance that forms the brain plaques that are associated with Alzheimer’s disease. 2

Vitamin D testing to evaluate levels and subsequent supplementation is something all clinicians, including RDs, can do.

How Should You Recommend That Clients Get Their Vitamin D?
The Office of Dietary supplements recommends serum 25-hydroxyvitamin D [25(OH)D] concentrations of >15 ng/mL (>37.5 nmol/L). 3 However, as noted in the above cited studies, most researchers utilized higher levels of 30 ng/mL for population studies as desirable for overall health and disease prevention. Furthermore, many clinicians aim for even higher levels of 50 – 60 ng/mL (125 – 150 nmol/L) for individuals. Serum concentrations of 25-hydroxy-vitamin D consistently >200 ng/ml (>500 nmol/L) are potentially toxic.

Humans get vitamin D from sun exposure, diet and from dietary supplements. The Adequate Intake (AI) for vitamin D is 5 mcg – 15 mcg (200 – 600 IU), depending on age. The AI is based on the assumption that no vitamin D is synthesized from sun exposure. 4

From the Sun
Michael F. Holick, Ph.D MD, as well as other researchers, recommend limited sun exposure to ensure adequate vitamin D levels. 3,5 They claim that health benefits from increased sun exposure outweigh the risk of skin cancer. 6 The American Academy of Dermatology disagrees and advises that photoprotective measures be taken whenever one is exposed to the sun. 7 The skin produces approximately 10,000 IUs vitamin D in response to 20–30 minutes of summer sun exposure. Factors influencing the amount of vitamin D from the sun include, age, geographic location, time of year, skin pigmentation and sunscreen usage. Most of the world’s population living in the northern hemisphere does not have sufficient sun exposure to produce enough vitamin D.

Dietary Supplements
Dietary supplement doses of vitamin D needed to achieve recommended 25-hydroxyvitamin D levels vary between individuals. Intakes of 700 – 1000 IU/day have been shown to achieve serum 25-hydroxyvitamin D levels of 36-40 ng/mL (90 – 100 nmol/L) in 50% of adult populations, while younger adults may need higher intakes. Levels of 4000 – 10,000 IU of vitamin D were found to be safe in younger adults. In regards to the type of supplement vitamin D3 (cholecalciferol) has been found to be more efficacious than vitamin D2 (ergocalciferol). In a study comparing the effectiveness of the two forms, both were found to produce a similar rise in serum levels. However, vitamin D3 had a more sustained peak that was still visible on day 14, whereas vitamin D2 returned to baseline by day 14. Other research showed oral vitamin D3 to be about 1.7 times more efficient than vitamin D2 for raising serum 25-hydroxyvitamin D. There is some reason for concern over excessive intake of vitamin D due to effects on vascular calcification, especially for individuals who frequently consume milk products. Getting enough vitamin D from supplements requires more than a standard multivitamin, since most only contain 400 IU of vitamin D.

Diet:
It is important to know that vitamin D, like all other nutrients does not work alone, and has many co-factors. These cofactors include: magnesium, zinc, vitamin K2, vitamin A. Therefore, it is important to provide adequate levels of these nutrients, when increasing vitamin D in the diet.
Table 1: Selected Food Sources of Vitamin D

<table>
<thead>
<tr>
<th>Food</th>
<th>IUs per serving*</th>
<th>Percent DV**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cod liver oil, 1 tablespoon</td>
<td>1,360</td>
<td>340</td>
</tr>
<tr>
<td>Salmon (sockeye), cooked, 3 ounces</td>
<td>794</td>
<td>199</td>
</tr>
<tr>
<td>Mushrooms that have been exposed to ultraviolet light to increase vitamin D, 3 ounces (not yet commonly available)</td>
<td>400</td>
<td>100</td>
</tr>
<tr>
<td>Mackerel, cooked, 3 ounces</td>
<td>388</td>
<td>97</td>
</tr>
<tr>
<td>Tuna fish, canned in water, drained, 3 ounces</td>
<td>154</td>
<td>39</td>
</tr>
<tr>
<td>Milk, nonfat, reduced fat, &amp; whole, vitamin D-fortified, 1 cup</td>
<td>115-124</td>
<td>29-31</td>
</tr>
<tr>
<td>Orange juice fortified with vitamin D, 1 cup (check product labels, as amount of added vitamin D varies)</td>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td>Yogurt, fortified with 20% of the DV for vitamin D, 6 ounces (more heavily fortified yogurts provide more of the DV)</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>Margarine, fortified, 1 tablespoon</td>
<td>60</td>
<td>15</td>
</tr>
<tr>
<td>Sardines, canned in oil, drained, 2 sardines</td>
<td>46</td>
<td>12</td>
</tr>
<tr>
<td>Liver, beef, cooked, 3.5 ounces</td>
<td>46</td>
<td>12</td>
</tr>
<tr>
<td>Ready-to-eat cereal, fortified with 10% of the DV for vitamin D, 0.75-1 cup (more heavily fortified cereals might provide more of the DV)</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>Egg, 1 whole (vitamin D is found in yolk)</td>
<td>25</td>
<td>6</td>
</tr>
<tr>
<td>Cheese, Swiss, 1 ounce</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>


*IU = International Units.

**DV = Daily Value. DVs were developed by the U.S. Food and Drug Administration to help consumers compare the nutrient contents of products within the context of a total diet. The DV for vitamin D is 400 IU for adults and children age 4 and older. Food labels, however, are not required to list vitamin D content unless a food has been fortified with this nutrient. Foods providing 20% or more of the DV are considered to be high sources of a nutrient.

The U.S. Department of Agriculture’s Nutrient Database Web site, http://www.nal.usda.gov/ars/usda/foodcomp/search, lists the nutrient content of many foods and provides a list of foods containing vitamin D: http://www.ars.usda.gov/SP2UserFiles/Place/12354500/Data/SR22/nutrlist/sr22a324.pdf. A growing number of foods are being analyzed for vitamin D content. Simpler and faster methods to measure vitamin D in foods are needed, as are food standard reference materials with certified values for vitamin D to ensure accurate measurements.

References:

For further reading:
did you know a human circadian rhythm defines a 24 hour physiological, biochemical, behavioral cycle; affected by availability of light, stress level, eating and sleeping times, temperature and exercise? Therefore, can you imagine how circadian rhythms affect our health and well-being? In fact, major acute health events do seem to occur at common times of the day and during particular seasons. According to a study in the Beijing metropolitan area, myocardial infarctions (MI) were found to occur frequently between 8 and 10 a.m. or 10 and 12 p.m. The Second International Study of Infarct Survival (ISIS-2) trial looked at five different geographic regions and found MI incidence increased between 6 a.m. and 8 a.m. and peaked between 8 and 11 a.m. The Triggers and Mechanisms of Myocardial Infarction (TRIMM) study group found MIs most commonly occurred within 3 hours of waking, between 6 and 9 a.m. Another study of medical records from the Beijing Emergency Medical Service found cases of Upper Gastrointestinal bleeding occurred more frequently during the cold months of the year and in the night time hours. Some research suggests insufficient sleep time and shift work negatively affect our circadian rhythms and increase our risk of developing metabolic syndrome, diabetes, heart disease and obesity. This calls attention to the importance and opportunity for the dietitian to integrate sleep into the holistic nutrition assessment and treatment plan. Additionally, some people are more biochemically sensitive to alterations in their circadian clock than others. The Circadian Locomotor Output Cycles Kaput (CLOCK), gene encodes a transcription factor responsible for modulating human circadian rhythms which affect metabolic alterations. Variations in the CLOCK gene have been linked to binge eating, reduced weight loss success, and the propensity to be a short time sleeper (≤ 6 hrs/night). In addition, although more research is necessary to draw a definitive conclusion, this same genetically unique group may be more susceptible to the negative metabolic effects of sleep loss.

Gastrointestinal motility is also rhythmic, with most people having bowel movements in the early morning and rarely at night. Gastrointestinal disruptions are common in shift workers and time zone travelers. In fact, the CLOCK gene is expressed in the cells of the colon. Individuals with certain CLOCK gene variations may be more susceptible to gastrointestinal dysfunction because of changes in sleep cycle.

This latest research on sleep calls attention to the importance and opportunity for the integrative and functional dietitian to integrate sleep into the holistic nutrition assessment and treatment plan. Stay tuned for more exciting research to be published on the CLOCK gene as our understanding of the impact of sleep on chronic disease, health, and well-being continues to expand.

A diagnosis of celiac disease or gluten sensitivity can be devastating news. However, thanks to the efforts of DIFM member Melinda Dennis, MS, RD, LDN and Daniel A. Leffler, MD, MS a new resource is available that will have a significant impact on those with either condition and will help identify those who are yet to be diagnosed. The authors, founding members of the Celiac Center at Beth Israel Deaconess Medical Center, Boston, MA, and more than 50 international experts share their wisdom and stories of patients who have celiac disease and gluten related disorders. What makes this book so valuable and unique is that Melinda Dennis, an editor and chapter author, was diagnosed with celiac disease over 20 years ago. She has drawn on her experience as a patient and a health care professional who has worked with celiac patients. She has incorporated her personal story into the book.

Real Life with Celiac Disease begins by discussing the basics: defining the condition, the myriad of tests available to diagnose the disease, and who should be tested for the disease. One of the most helpful chapters may be on the common and uncommon presentations of celiac disease. Since all systems of the body may be affected by the disease and many symptoms are not unique to the disease, diagnosis is often delayed or never happens.

The authors explain in detail typical and atypical manifestations of celiac disease and suggest situations where testing is appropriate.

“The Gluten-Free Life: Solutions and Strategies” is a series of chapters on what is focused on most often—food. The authors explore issues ranging from a balanced diet to food labeling, supplementation to prescription medications, and topics often overlooked when discussing a gluten-free lifestyle. Since food and mood are so closely related, a chapter addresses depression and anxiety.

The next section, titled “The Obstacles,” includes twenty chapters about allergies, intolerances, irritable bowel, probiotics and small bowel overgrowth, reproduction and more. Following this section are resources including support groups, advocacy information, how to be gluten-free when in health care facilities, and a glossary of common terms that round out the content of the book.

Each chapter written by a leading expert in the field includes a case study that helps the reader apply the knowledge gained by the topic. At the end of each chapter are self-management tips that can guide the nutrition and healthcare professional or the patient on additional points to consider. For example, two tips in the chapter on autoimmune diseases are: “Several autoimmune diseases are more common in people with celiac disease,” and “Liver and thyroid tests should be done routinely in patients with celiac disease.”

Many of the chapter authors not only work with patients with celiac disease, but some also are living with the disease. In my opinion, this credible resource should be every registered dietitian’s reference for information and recommendation to patients regarding celiac disease, gluten intolerance, and the diet.

Reviewed by: Sarah Harding Laidlaw, MS RD CDE, DIFM Newsletter Editor.

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Chair’s Corner:  
Deborah Ford, MS RD CCN

W e ‘chairs’ tend to wax poetic in the quarterly column and I think that is because we take time to reflect fondly on our volunteer years to Dietitians in Integrative and Functional Medicine (DIFM). I am not exempt from this tendency as I have had many years with this pioneering group and I have witnessed many positive changes in how we integrate natural therapies into healthcare.

Past Present & Future…..

Past:
Our dietetic practice group (DPG) has possessed a strong vision from the beginning when the bold founding members felt the time had come for alternative medicine to find a place in the dietetics profession. These ADA members were passionate about the need for a more holistic approach to healthcare and the integration of many useful approaches to help the body heal or maintain health. For those utilizing ‘alternative’ therapy ten to fifteen years ago, evidence or practiced based research and publication was just budding in the area of herbal and vitamin therapy, with limited resources and with more than a bit of guesswork.

Present:
The current resources available for integrative therapy are astounding in their quality and usefulness. Due to the vision of our volunteer leaders, DIFM has arranged for some remarkable networking relationships and educational venues with sizable discounts available. I encourage you to look at these discounts and I look forward to seeing you at many of the upcoming events. Some of the networks that offer discounts to DIFM RDs include American Botanical Council, Omega 3 Learning, The Center for Mind-Body Medicine, The Institute for Functional Medicine, and the University of Arizona. Other useful benefits include the Natural Standard Database, which is a great online resource and is available through our website, www.integrativeRD.org. The database will give you the latest information in dietary supplement research as well as allow you to check for interactions between pharmaceuticals and natural approaches. In addition, our volunteers are lining up some tremendous webinars for your education.

This proves to be a very “brainy” year at FNCE Boston 2010. Be sure to sign up today and be there early Saturday morning for a great PreFNCE Symposium:

Saturday, November 6 at 7:30 AM
Cognitive Function throughout the Lifecycle: The role of critical nutrients and functional foods essential for brain health and development.

This symposium is complemented by culinary demonstrations that will bring the science of nutrition to the table. A ‘brainy’ lunch is provided for those who preregister for $99! I hope to see you there.

Tuesday, November 9th at 8:00 AM
Spotlight Session: Integrative Medicine in Depression and Mood Disorders—Research to Practice

The dietitian is an important partner in patient healthcare and needs to be educated in the evidence based research on integrative and alternative therapies that are being utilized by the physician and self-treating population. The clear and evident trends in health care require dietitians know the best sources of omega-3, an essential fat, and be knowledgeable in alternative therapies that are growing in popularity and being integrated into medical practice. Be knowledgeable in the uses of St John’s wort, kava, omega-3, valerian, and acupuncture in mood disorders, including depression, anxiety, seasonal affective disorder, and other common complaints.

Future:
Currently, we are working on Standards of Practice and Standards of Professional Performance for DIFM (fondly known as SOP/SOPP). This will serve as a guide to dietitians who wish to apply integrative and functional approaches to their practices. This has been a real labor of love for the committee as we strive to ‘get it right’ and raise the bar in nutrition healthcare. Look forward to its publication in the Journal of the American Dietetic Association in the early part of 2011.

In fact, the future is being written by you, the bold visionary leaders who have inherited a legacy from those who began this DPG. It has been said, “the world is run by the people who show up to run,” those willing to participate and volunteer their time and talents to benefit the whole. You don’t have to know everything, but you have to be willing and giving. That is all.

As I take the chair position, I reflect on my years of volunteer leadership as secretary and other positions. I am thankful for the great mentoring. Roz Kulik, MS RD FADA showed me the ropes, helping me to become a good secretary and now recently, Kathie Swift, MS RD LDN shares her skill, helping me to hold the chair position and get us to FNCE with great educational programs all along the way.

IT’S AN EXCITING TIME FOR ALL OF US!

Dietetic didactic programs and textbooks are being rewritten to include the foundations of integrative and functional approach. The future? We’ll see it together as together we write!

Best to you,

Deb
Summer is winding down and many of you are sending children off to school or maybe even going back yourself. Knowledge is power and that of course comes with education—whether from school, online programs and webinars, or from meetings such as ADA’s Food & Nutrition Conference & Expo (FNCE). Knowledge available through the many DIFM offerings has the potential to make you, our member, a powerful individual in the field of integrative and functional medicine.

As the dietetic practice group that specializes in integrative and functional medicine, we are fortunate to have some of the top leaders, thinkers, and practitioners associated with DIFM. The knowledge and resources they offer can put each one of us ahead of those who are not members of DIFM; we just need to take advantage of what is available. Ruth DeBusk, PhD RD a founding member and international leader in the area of nutritional genomics has secured an agreement with the New England Journal of Medicine to make subscriber-only articles on genomics available to our members. (See the DIFM website, www.integrativeRD.org, and the short description in this issue for more information.)

Kathie Swift, MS RD LDN, former DIFM Chair, Colleen Draper, MS RD LDN and Elizabeth Redmond, PhD MMSc RD LD are just a few of the other movers and shakers in functional medicine, nutritional genomics, AND DIFM! Networking agreements with numerous organizations, including the Omega-3 Learning Center, offer members credible resources that cannot be found elsewhere. And lest we forget, Diana Noland, MPH, RD, CCN a faculty member of the Institute for Functional Medicine, has helped promote functional medicine among RDs. Furthermore, our affiliation with the Institute for Functional Medicine offers numerous educational opportunities for members.

This year at FNCE we have more opportunities than ever to expand our knowledge base about functional medicine. The summer newsletter supplement that you received details the many superb offerings at this year’s FNCE in Boston. In addition, there is an insert included that may be kept for future reference on the many DIFM member benefits as well as a list of DIFM leaders. As always, your comments, suggestions, and offers to write or volunteer are welcome. Please feel free to contact me at peaknut@cascade access.com.

New Member Benefit
Genomics, including pharmacogenomics and nutritional genomics, is providing the framework for a new era of personalized health care. Prominent journals are publishing reviews of various genomic-related topics. Within the member section of the DIFM website at www.integrativeRD.org are the articles on nutritional genomics published by the Journal of the American Dietetic Association. DIFM has now secured permission for members to also have access to the full articles in the new series on genomic medicine recently launched by the New England Journal of Medicine (NEJM).

Four articles are now available, including Ten Years On — The Human Genome and Medicine and Genomic Medicine: An Updated Primer. Click on the links in the member section of the website for direct access to the full articles. Additionally, you’ll find links to each of the articles in the original NEJM genomic medicine series. Although some of the details in the original articles are now out of date, you will likely find the background information useful for understanding how genomics influences health and disease.

Ruth DeBusk, PhD RD

Go to page 15
Cognitive Function Throughout the Lifecycle:

*The role of critical nutrients and functional foods essential for brain health and development*

2010 preFNCE Symposium

Register at [www.IntegrativeRD.org](http://www.IntegrativeRD.org)

In Boston on **Saturday, November 6th**, DIFM DPG PreFNCE symposium speakers will discuss nutritional approaches to neurodegenerative diseases; omega-3 fatty acids and their potential actions on the endocannabinoid signaling system (neuromodulatory lipids and their receptors involved in numerous physiological processes including appetite, pain-sensation, mood, and memory); dietary phytochemicals and botanicals as medicine in cognitive health and brain function; pertinent case studies review.

All FNCE attendees are invited to participate. 6 CPEUs provided.

Investment: $99.00 for DIFM members; $129.00 for non-members.

**PROGRAM OBJECTIVES**

- Explain the importance of modifiable factors involved in the inflammatory cascade
- Recognize the fundamental role of specific antioxidants in preserving brain function
- Describe effective nutritional interventions for neurological conditions
- Describe the safety issues associated with different organ systems
- Identify the use of plants as medicine in brain function and health
- Identify different omega-3 polyunsaturated fatty acids and their physiologic actions
- Review clinical applications pertinent laboratory tests, and the research behind them
2010 preFNCE Symposium

www.IntegrativeRD.org

November 6, 2010
Agenda & Topics

7:00 - 7:45 AM  Registration

7:45 - 8:00   Welcome and Introduction

8:00 - 9:30   Nutritional Approaches to Cognitive Health and Neurodegenerative Diseases
The speaker will explore less commonly applied, but nonetheless powerfully effective interventions for neurological conditions supported by peer-reviewed research, as well as recognizing the fundamental role of antioxidants in preserving and enhancing brain function.

Dr. David Perlmutter MD FACN ABIHM, Board-Certified Neurologist; Fellow of the American College of Nutrition; Author of The Better Brain Book. http://perlhealth.com/about-dr-perlmutter/

9:30 - 9:45  Break

9:45 - 11:15  The Use of Plants as Medicine in Brain Function and Health
The speaker will cover the use of plants as medicine in brain function and health, the safety issues associated with different organ systems, direct and indirect toxicities of plants and natural products, and botanicals as medicine in brain function.

Lana Dvorkin-Camiel, PharmD RPh, Director of Master of Applied Natural Products; Program Associate Professor of Pharmacy Practice Natural Products Division; Coordinator Massachusetts School of Pharmacy. http://www.mcphs.edu/directories/bio.aspx?id=43

11:15 - 12:30  Functional Food Buffet Luncheon: Product Exhibits

12:30 - 2:00  Omega-3 Fatty Acids in Brain Health and the Endocannabinoid Signaling System
Docosahexaenoic acid is a principle omega-3 for proper brain development and plays a key role in systemic energy balance, as well as the physiology of muscle and adipose tissue. The purpose of this topic is to explain the potential actions of omega-3 polyunsaturated fatty acids derived from the diet on the endocannabinoid signaling system.

Bruce Watkins, PhD FACN, Professor, Purdue University; Adjunct Professor, School of Medicine, Indiana University. http://www.omega3learning.purdue.edu/about-us/structure/executive-committee/watkins/

2:00 – 3:00  Putting Neurological Nutrition into Practice: Case Studies
Case studies will review how targeted interventions can make a difference in neurological and cognitive conditions. Case study interventions will include normal dietary amounts of certain foods as well as targeted supplements. Discussions will review pertinent laboratory tests and the research behind them.

DIFM Member Business Breakfast and Presentation

Monday, November 8, 2010  7 a.m. — 9 a.m.

*Phytonutrients in the American Diet: Filling in the Gaps*

Speaker: Keith Randolph, PhD, Technology Strategist

Sponsored by Nutrilite Health Institute

Renaissance Boston Waterfront – Atlantic Ballroom 1

Reserve your seat, register today

Name: _______________________________________________________

Address: ____________________________________________________

City/State/Zip code: ___________________________________________

ADA Number: _________________________________________________

Today’s Date: ________________________________________________

Final day of registration:  October 22, 2010

Email completed registration to info@integrativerd.org or fax to 877-862-8390

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