Microbes at the Table: The Role of the Gut Microbiome and Related Nutritional Interventions in the Treatment of Anorexia Nervosa

Katherine Stephens-Bogard, MS, RDN, CDE, RYT and Sherie L. Edenborn, MT (ASCP), PhD

Objectives

After completing this CPE activity, the nutrition professional will be able to:

1) Discuss the evidence that suggests a relationship between the gut microbiome and anorexia nervosa.
2) Describe functional and integrative nutritional interventions for the treatment of anorexia nervosa.
3) Determine which integrative treatment approaches would be appropriate given different practice settings.

Introduction

Eating Disorders (EDs) are complex psycho-behavioral metabolic illnesses that arise from epigenetic, psycho-neuroendocrine, socio-cultural, environmental, biochemical and nutritional interactions. Complications are similarly multi-systemic, affecting the neuroendocrine, gastrointestinal (GI), cardiovascular, musculoskeletal, and reproductive systems, but also psychosocial well-being and emotional health. Likewise, the treatment is increasingly multifaceted. Novel approaches to treatment have garnered recent attention owing to a convergence of many branches of biomedical and behavioral sciences including, but not limited to: neuroscience and its subdivisions—neuropsychiatry, psychoneuroimmunology, neuroanatomy and neuroimaging—and the biological sciences—genetics and genomics, nutritional biochemistry, and microbiology, most notably, GI microbiology.

This article presents an integrative and functional view of Anorexia Nervosa (AN). Specifically, it illustrates how the GI microbiome and the gut-brain axis (GBA) act as both an antecedent and mediator in the pathogenesis and treatment of AN. Relevant research is summarized and contemporary nutritional treatment modalities are highlighted, serving as a foundation for exploring how functional and integrative dietary interventions may improve metabolic and mental health via modulation of the GI microbiome and GBA. Translation of the empirical science into practical clinical nutrition treatment recommendations with suggested areas of ongoing research concludes the review.

Eating Disorder Review—Diagnosis, Epidemiology, and Genetics

The American Psychiatric Association’s Diagnostic and Statistical Manual of Mental Health Disorders Fifth Edition defines and distinguishes four categories of EDs: AN, Bulimia Nervosa (BN), Binge-Eating Disorder (BED), and other specified feeding or eating disorders (OSFED). Recent studies have revealed co-morbid and confounding diagnoses of depression and anxiety, obsessive compulsive disorder, impulse control disorders, attention deficit...
hyperactivity disorders and autism spectrum disorders (ASD), which have a very similar cognitive profile to AN.7-29 These include deficits in social cognition and emotional regulation and the inability to adapt to change, marked by such behaviors as insistence on sameness and rigid patterns in thinking and behavior.29 In fact, clinical research in those [women] with chronic enduring AN often referred to it as the “female Aspergers.”31

Establishing the exact epidemiology of EDs is difficult. Data from the National Comorbidity Survey Replication (NCS-R)32 indicates that fewer than half of individuals with EDs access care for their illness. Furthermore, it is estimated that 50% of EDs are missed in the clinical setting. Notwithstanding these variables, the lifetime prevalence of AN is estimated at 0.9% for adult females, 0.5% for adult males, and 0.3% among adolescents of either gender.32

The genetics of EDs continue to be elucidated. The heritability of AN and BN is estimated between 33% and 84%.32 To date, the genetics of EDs have been explored using linkage and association studies, candidate genes and genomic association studies, gene-expression and epigenetics such as DNA methylation, and gene-by-environment interactions.5,6,7 Though no single gene has been found to be a major risk factor, independent familial studies have found variations in genes such as the opioid delta receptor (OPRD1), which are related to specific characteristics of AN such as addictive behaviors.33,34 It seems likely that genomic and genetic factors are interdependent in shaping AN susceptibility, illness course, and outcome. Further, it is possible that nutritional genomics will enable more personalized development of nutritional, nutraceutical, and pharmacological interventions.

Microbes in the Mirror: Anorexia Nervosa Reflected in Gastrointestinal Microbiome

Over the past ten years, research has revealed that the average human is colonized by an estimated 100 to 350 trillion microorganisms.35 These microorganisms along with all their genes are collectively called the human microbiome and are considered to be as essential as our own cells in modulating physiology,36 immunity to infectious disease,37 and even behavior.38,39 The microbial communities associated with the human body vary based on anatomical location, with the GI or “gut microbiome” having the greatest number and diversity of microorganisms. Research suggests that the human gut microbiome is comprised of five major bacterial phyla as well as a core microbiome comprised of 14 different genera (Figure 1).40-42 There also is evidence that many of the microorganisms in a person’s microbiome are individually unique.43 Dysbiosis has been linked to a variety of physical and mental disorders, including AN,16 and can be characterized at different levels of the taxonomic hierarchy.

**Important Terms**

- **Dysbiosis** - perturbations, alterations, or imbalances in the diversity and/or composition of microorganisms in the human microbiome. Gut dysbiosis refers to imbalances in the GI tract.
- **Probiotics** - “live microorganisms that, when administered in adequate amounts, confer a health benefit on the host.”92
- **Prebiotic** - a non-digestible compound that, through its metabolism by microorganisms in the gut, modulates composition and/or activity of the gut microbiota, thus conferring a beneficial physiological effect on the host.93 In most cases, probiotics work best if matched with appropriate prebiotics.
- **Psychobiotic** - as proposed by Sarkar et al.,94 includes probiotics and prebiotics that work synergistically to confer mental health benefits to the host.

Orthorexia - “self-imposed rigid fixation on righteous eating”90 an obsessive focus on “healthy” eating (e.g. vegan/vegetarianism, chemical-pesticide free, quantity/frequency of macronutrients) as individually defined and marked by increasingly restrictive dietary practices such that self-esteem, social functioning, and even physical health are negatively impacted.44

More recently, research has revealed the critical importance of diet in regulating the structure of the GI microbiome and associated effects on human health.45-48 Collectively, evidence that links diet with alterations in the microbiome and health may provide a framework for developing and monitoring nutritional interventions for the treatment of obesity, malnutrition and AN.49

In 2000, Sokol50 provided evidence that the development of AN may be related to specific microorganisms. In this groundbreaking study, prior infections with Group A streptococci were related to the development of AN and Pediatric Autoimmune Neuropsychiatric Disorders Associated with Streptococcal...
before and after weight restoration and noted no change in the gut microbiome or GI symptoms. Compared to controls, Kleiman et al. noted that patients with AN had less taxa diversity at treatment onset and after weight restoration. Specifically, persistent perturbations in the family Ruminococcaceae (genus Parabacteroides) were observed. Interestingly, this family of bacteria is also associated with intestinal disorders marked by inflammation including irritable bowel syndrome (IBS) and inflammatory bowel disease (IBD).

**Modulation of the AN Microbiome and GBA via Nutritional Intervention**

Our expanded understanding of how the structure and function of the microbiome can affect physical and mental health provides a role for nutritional intervention in the treatment of neuropsychiatric disorders such as AN. Central to this new paradigm has been the discovery of the ways in which the gut microbiota communicates with the nervous, endocrine, immune and digestive systems. Most amazing has been the discovery of the GBA, which is a bidirectional pathway between the brain and the enteric nervous system (ENS). At one end of this axis lies the brain and the blood brain barrier (BBB), which regulates the passage of oxygen, nutrients, neurotransmitters, and cytokines into the cerebrospinal fluid (CSF) and protects it from harmful microorganisms and chemicals. At the other end is the gut and ENS, which is similar in complexity and importance to the brain and is able to sense biological and chemical agents derived from the host and imported from the environment. Also present are the cells and proteins of the immune and endocrine systems that act as sentinels and deliver signals that provide information that can help protect the brain and body or direct them into a state of unbalance. Figure 2 summarizes the mechanisms by which the GI microbiome communicates with the brain; more detailed information can be found in associated review articles.

**Communication Pathways in the Gut-Brain Axis**

![Diagram](https://www.integrativeRD.org)

For nutritional intervention to be involved in both the GI and psychiatric conditions associated with this disorder.

Although these studies document a pattern of dysbiosis, there is a paucity of data that weight restoration, in fact, restores the GI microbiome. Mack et al. examined the microbiome of AN clients for nutritional intervention in the treatment of neuropsychiatric disorders such as AN. Central to this new paradigm has been the discovery of the ways in which the gut microbiota communicates with the nervous, endocrine, immune and digestive systems. Most amazing has been the discovery of the GBA, which is a bi-directional pathway between the brain and the enteric nervous system (ENS). At one end of this axis lies the brain and the blood brain barrier (BBB), which regulates the passage of oxygen, nutrients, neurotransmitters, and cytokines into the cerebrospinal fluid (CSF) and protects it from harmful microorganisms and chemicals. At the other end is the gut and ENS, which is similar in complexity and importance to the brain and is able to sense biological and chemical agents derived from the host and imported from the environment. Also present are the cells and proteins of the immune and endocrine systems that act as sentinels and deliver signals that provide information that can help protect the brain and body or direct them into a state of unbalance. Figure 2 summarizes the mechanisms by which the GI microbiome communicates with the brain; more detailed information can be found in associated review articles.
the development of autoantibodies against appetite-regulating neuropeptides (ARNP) such as ghrelin and α-melanocyte-stimulating hormone (α-MSH). This model is supported by a study by Fetissov et al., which showed that plasma concentrations of ghrelin have been directly related to scores on the Eating Disorder Inventory-2 (EDI-2) in patients with AN. The autoantibody hypothesis is of particular importance to RDNs because autoantibodies against ARNP are generated against microorganisms in the GI tract, including those that are introduced by food or supplements. Of particular concern are Lactococcus lactis and Bifidobacterium longum, which share similarities to known antigens that stimulate the production of ARNP. L. lactis and B. longum are found in both supplements (Table 1) and food, especially cheeses—colby, cheddar, cottage, cream, and blue—as well as fermented milk products such as sour cream and buttermilk. More evidence is necessary to support the potential role of these bacteria in symptoms of AN, but these data may support empirical observations made by RDNs involved in the nutritional management of patients with AN.

The previous example illustrates how an understanding of the microbiome provides clinicians with a new platform to integrate evidence-based practice in their treatment plans for AN. Because of the overlapping neurocognitive profiles of ASD and AN, studies regarding the use of nutritional interventions that help mitigate GI and cognitive symptoms in patients with ASD provide related evidence. Functional and integrative nutritional interventions supported by existing evidence include probiotics, prebiotics, psychobiotics, polyphenols, and omega-3 fatty acids (n-3s).

Probiotics/Psychobiotics/Prebiotics

Selecting the appropriate probiotic/psychobiotic agents for the treatment of AN should be guided by both the clinical pathology and the known abilities of the specific probiotic agent to mitigate AN symptomatology. For example, probiotic agents have been shown to modulate weight in both humans and animals. Evidence also suggests that a variety of microbial agents can support GI health, which should in theory support the GABA and thus cognitive function in persons with AN. Ritchie et al. used meta-analysis to evaluate the effects of 11 species of probiotic bacteria and probiotic mixes on eight different GI diseases. They reported significant positive effects except for Lactobacillus acidophilus, Lactobacillus plantarum, and Bifidobacterium infantis. Kennedy et al. summarized human clinical trials that demonstrated improvement in recall and recognition and in emotional regulation, and a decrease in anxiety, depression and sad mood following targeted pre/probiotic supplementation. Similarly, a variety of psychotropic bacteria, including Lactobacillus rhamnosus and Bifidobacterium infantis, have been shown to modify host mental health via regulating neurotransmitter synthesis, modulating the production of pro-inflammatory cytokines, and communicating with the brain via the vagus nerve. Table 1 pg. 95 provides additional information about probiotic bacteria and yeast that have been shown to modulate weight, mood, and GI health.

A fully integrated treatment approach will combine appropriate probiotic/psychobiotic microorganisms with complementary prebiotics. Examples of prebiotics are galacto-oligosaccharides (GOS), fructo-oligosaccharides (FOS), inulin and lactulose, starch, pectin, dietary fibers, and whole grains, as well as human milk oligosaccharides. Prebiotic foods enhance the functional capabilities of probiotic/psychobiotic bacteria by stimulating their growth and activity and providing substrates that facilitate the production of metabolic end products such as short-chain fatty acids (SCFA) and neurotransmitters that can positively affect host physiology. Lactic acid bacteria, found in such functional foods as cheese, yogurt, fresh milk, kimchi, cabbage, fermented fish, and Chinese paocai, are major producers of the neurotransmitter gamma-aminobutyric acid (GABA). Deficiency increases the velocity of synaptic transmission leading to an increase in emotional dysregulation, anxiety, agitation, panic attacks and addictive behaviors. Likewise, the neurotransmitters serotonin and dopamine can be synthesized by GI bacteria from the amino acid precursors tryptophan and phenylalanine. Food sources include berries, citrus, red wine, coffee, tea, and cocoa. Epidemiological and interventional studies suggest that a diet rich in polyphenols may help maintain normal brain function and cognitive processing, improve emotional regulation and decrease anxiety and depression. It is hypothesized that anti-inflammatory, anti-oxidant, and enzymatic modulation of phenolic compounds accounts for their positive CNS effect. Polyphenolic compounds are not only metabolized by the gut microbiota but also modulate their composition. For example, green and black tea have been shown to retard the growth of dysbiotic Helicobacter pylori, Staphylococcus aureus, Salmonella typhimurium, and Listeria monocytogenes bacteria while other polyphenols have been shown to promote the growth of beneficial bacteria such as Bifidobacterium spp.

Omega-3 Fatty Acids

Found in cold-water fatty fish, nuts and seeds (chia, hemp, flax), as well as in fortified foods, dietary omega-3s (n-3s) have been studied with regard to nearly every aspect of cognitive brain function and mental health. Omega-3s play pivotal roles in synaptic plasticity, monoaminergic (i.e. dopamine and serotonin) neurotransmission, modulating HPA axis activity, and reducing central and peripheral inflammation. Via these mechanisms, preclinical and clinical trials have shown improvements in anxiety, depression, emotional reactivity and impulse control, perfectionism and cognitive behaviors. Similarly, many of...
### Table 1. Microorganisms Shown to Modulate Weight, Gastrointestinal Symptoms, and Mood

<table>
<thead>
<tr>
<th>Genus</th>
<th>Species</th>
<th>Effects on Weight*</th>
<th>Effects on Gl Tract**</th>
<th>Effects on Mood***</th>
<th>Dietary Sources</th>
<th>Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lactobacillus</td>
<td>acidophilus&lt;sup&gt;a&lt;/sup&gt;</td>
<td>↑52</td>
<td>↓70</td>
<td>↓97</td>
<td>Yogurt, fermented milk, tempeh, soy sauce, miso, kombucha&lt;sup&gt;77,105&lt;/sup&gt;</td>
<td>Supplements&lt;sup&gt;98&lt;/sup&gt;</td>
</tr>
<tr>
<td>Lactobacillus</td>
<td>rhamnosus&lt;sup&gt;b&lt;/sup&gt;</td>
<td>↑52</td>
<td>↑97</td>
<td>↓97,99</td>
<td>Supplements&lt;sup&gt;98&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Lactobacillus</td>
<td>casei&lt;sup&gt;c&lt;/sup&gt;</td>
<td>↓97</td>
<td>↓70</td>
<td>↓100</td>
<td>Water kefir&lt;sup&gt;77&lt;/sup&gt;, fermented milk&lt;sup&gt;100&lt;/sup&gt;, supplements&lt;sup&gt;98&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Lactobacillus</td>
<td>salivarius&lt;sup&gt;d&lt;/sup&gt;</td>
<td>↑52</td>
<td>↓52</td>
<td>Supplements&lt;sup&gt;52&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lactobacillus</td>
<td>plantarum&lt;sup&gt;e&lt;/sup&gt;</td>
<td>↓101</td>
<td>↓7,97</td>
<td>Supplements&lt;sup&gt;97,98&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lactobacillus</td>
<td>paracasei&lt;sup&gt;f&lt;/sup&gt;</td>
<td>↓97</td>
<td>↓7,97</td>
<td>Yogurt, fermented milk&lt;sup&gt;97&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lactobacillus</td>
<td>bulgaricus&lt;sup&gt;g&lt;/sup&gt;</td>
<td>↓101</td>
<td>Supplements&lt;sup&gt;101&lt;/sup&gt;, supplements&lt;sup&gt;74&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lactobacillus</td>
<td>fermentum&lt;sup&gt;h&lt;/sup&gt;</td>
<td>↑52</td>
<td>↓97</td>
<td>Supplements&lt;sup&gt;52,97,98&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lactobacillus</td>
<td>reuteri&lt;sup&gt;i&lt;/sup&gt;</td>
<td>↑5245</td>
<td>↓7,97</td>
<td>Supplements&lt;sup&gt;98&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lactobacillus</td>
<td>helveticus&lt;sup&gt;j&lt;/sup&gt;</td>
<td>↑97,102</td>
<td>↑197,102</td>
<td>Supplements&lt;sup&gt;98&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lactobacillus</td>
<td>gasseri&lt;sup&gt;k&lt;/sup&gt;</td>
<td>↓52</td>
<td>Supplements&lt;sup&gt;97,98&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lactobacillus</td>
<td>lactis&lt;sup&lt;l&lt;/sup&gt;</td>
<td>↓101</td>
<td>Supplements&lt;sup&gt;98&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Genus</th>
<th>Species</th>
<th>Effects on Weight*</th>
<th>Effects on Gl Tract**</th>
<th>Effects on Mood***</th>
<th>Dietary Sources</th>
<th>Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bifidobacterium</td>
<td>animalis&lt;sup&gt;m&lt;/sup&gt;</td>
<td>↓52,103</td>
<td>↓97</td>
<td>↓101</td>
<td>Fermented milk&lt;sup&gt;101&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Bifidobacterium</td>
<td>bifidum&lt;sup&gt;n&lt;/sup&gt;</td>
<td>↓97</td>
<td>↓97</td>
<td>↓97</td>
<td>Supplements&lt;sup&gt;97,98&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Bifidobacterium</td>
<td>breve&lt;sup&gt;o&lt;/sup&gt;</td>
<td>↓7,97</td>
<td>↓97</td>
<td>Supplements&lt;sup&gt;98&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bifidobacterium</td>
<td>infantis&lt;sup&gt;p&lt;/sup&gt;</td>
<td>↓7,97</td>
<td>↓97</td>
<td>Supplements&lt;sup&gt;98&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bifidobacterium</td>
<td>lactis&lt;sup&gt;q&lt;/sup&gt;</td>
<td>↓97</td>
<td>↑97</td>
<td>Supplements&lt;sup&gt;97,98&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bifidobacterium</td>
<td>longum&lt;sup&gt;r&lt;/sup&gt;</td>
<td>↓52</td>
<td>↓97,98,103</td>
<td>Supplements&lt;sup&gt;97,98&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Genus</th>
<th>Species</th>
<th>Effects on Weight*</th>
<th>Effects on Gl Tract**</th>
<th>Effects on Mood***</th>
<th>Dietary Sources</th>
<th>Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterococcus</td>
<td>faecalis&lt;sup&gt;s&lt;/sup&gt;</td>
<td>↓97</td>
<td>↓101</td>
<td>Possible pathogenicity&lt;sup&gt;102&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Streptococcus</td>
<td>thermophilis&lt;sup&gt;t&lt;/sup&gt;</td>
<td>↓104</td>
<td>↓97</td>
<td>Fermented milk, yogurt&lt;sup&gt;97&lt;/sup&gt;, Supplements&lt;sup&gt;92&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saccharomyces</td>
<td>boulardii&lt;sup&gt;u&lt;/sup&gt;</td>
<td>↓104</td>
<td>↓97</td>
<td>Supplements&lt;sup&gt;98&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Key:**
*↑* increase weight, *↓* decrease weight, *→* no weight change
*↑* decrease constipation/pain/bloating/inflammation
*↓* decrease anxiety/depression

Superscript lower-case letters: % of species found in branded supplements as reported by Labdoor (<https://labdoor.com>) (established strains, when known)
a 77% (La-14); b 55% (PR-32, GG); c 42% (LC-11); d 39% (Ls-33); e 26% (Lp-115); f 23% (Lpc-37); g 19%; h N/A; i N/A; j 10%; k 10%; l 6%; m <1%; n 50% (spp); o 31%; p 16%; q 50%; r 50%; s <1%; t 19%; u <1%

In seeking sponsors, DIFM has established product standards for products and services of value to the integrative and functional medicine field. We consider product quality, efficacy, manufacturing, and business practices among other criteria. We encourage all professionals and individuals to choose products aligned with their own specific standards.

Dietitians in Integrative and Functional Medicine

a dietetic practice group of the Academy of Nutrition and Dietetics
The central effects are mediated through GI bacteria. For example, in vitro and animal studies suggest n-3s can promote growth of strains of Lactobacillus; conversely, lactobacilli can modulate n-3 absorption. Furthermore, n-3s increase growth of bifidobacteria and reduce growth of dysbiotic enteric bacteria.

Microbes by Meal from Bench to Table: Translation and Clinical Application

Contemporary nutritional treatment paradigms include variations in exchange-based meal plans, staff/family measured portioning within a calorically-appropriate structured meal plan, as well as inclusion of mindfulness based intuitive eating philosophies. Nutrient requirements are determined by both the medical examination and related tests (i.e. labs, EKG, and bone density) as well as the nutrition-focused assessment. Notwithstanding the need to weight restore and pharmacologically supplement nutrients of concern as medically identified, the RDN integrating a functional approach to AN could include the previously highlighted components: probiotics, polyphenols, and n-3s. Inclusion criteria, importance and timing of introduction are dependent on the type of practice setting: inpatient hospitalization (IP), specialty hospital inpatient treatment, commonly referenced as residential treatment (RT), intensive outpatient (IOP), or outpatient (OP). For example, IP is primarily tasked with medical stabilization to include progressive weight restoration without iatrogenic refeeding syndrome. An integrative approach in this setting could include supplemental probiotics and n-3s regardless of feeding route—enteral or by mouth (PO). As PO intake improves, food sources providing prebiotics, probiotics, n-3s and phenolic compounds in tandem with other calorically nutrient dense foods should be included in the rotational menu. Transitioning to RT, IOP, and OP treatment, the integrative RDN should continue to increase the variety of functional foods. Supplemental n-3s and probiotics may also be continued, but bacterial strains may need to be changed depending on AN...
symptomatology and/or treatment priority (Table 1). Likewise, the RDN will necessarily need to address each client’s individual orthorexic8 food ideology.7,8,9,12,34 Tables 2 and 3 illustrate an example of a patient-centric mindfulness-based integrative and functional food nutrition prescription for a client currently receiving OP medical nutrition therapy (MNT).

Concomitantly, as part of MNT and nutrition education, a food-as-medicine module could be included. The goal of this would be to expand upon the traditional treatment paradigm of nutrition education in food procurement, selection, and preparation across the spectrum of eating environments—restaurant, buffet/cafeteria, social dining, and home cooking. In this functional and integrative approach, the client is tasked with procuring supplies to cultivate a fermentable food of choice (i.e. kombucha, yogurt, or kefir). Similarly, the client is invited to grow a mini-culinary garden. Such applications not only allow food and nutrition science education in a creative non-threatening way but also promote greater microbial diversity. Digging in the soil—cultivating a mini-garden—exposes the client to a greater number of bacterial phyla and species, promoting microbial diversity and augmenting proper immune function.95 Furthermore, farm-to-table activities are a great platform upon which to discuss energy metabolism, macronutrient utilization, functional foods and bioactive substances and their relationship in the GBA and HPA axis, and the roles these play in mood and recovery.

Conclusions

The complexity of the pathogenesis as well as the treatment96 of AN is well-established. Building upon current scientific foundations, further studies should: 1) Analyze the microbiome of AN clients pre- and post-weight restoration following a hyper-caloric functional food and strategic supplementation protocol; 2) Further explore probiotic species and utilitarian functionality of psychobiotics; and 3) Investigate the role of nutrients in the epigenetics and genomics of AN. Because AN treatment is necessarily multidisciplinary, by partnering with clinical researchers, RDNs can enhance research methodology by designing the nutritional protocol. Clinically, RDNs can include functional foods along with targeted supplementation as well as kinesthetic learning into MNT; this supports both restoration of physical and mental health and augments the work of the mental health providers.

Table 2. Mindfulness Based Functional Food and Nutrient Group Guided Meal Plan

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Minimum* Number of Servings/day</th>
<th>Specific Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit</td>
<td>6 (5 as fruit, 1 as juice)</td>
<td>One vitamin C rich juice to be drunk with non-heme plant food; include citrus, berries, and bananas</td>
</tr>
<tr>
<td>Vegetables</td>
<td>Unlimited</td>
<td>Consider fermented veggies (i.e. sauerkraut, kimchee, kvass)</td>
</tr>
<tr>
<td>Dairy or non-dairy equivalent</td>
<td>3</td>
<td>One per day is either yogurt or kefir; all must be full-fat</td>
</tr>
<tr>
<td>Lipid</td>
<td>5</td>
<td>Two must be rich in n-3s</td>
</tr>
<tr>
<td>Grains, beans, legumes &amp; other plant protein</td>
<td>6</td>
<td>Choose a variety of whole grains and/or those fortified with iron, as well as those loaded with (prebiotic) fiber</td>
</tr>
<tr>
<td>Fermentable food/beverage</td>
<td>1</td>
<td>In addition to yogurt/kefir—consider Kombucha, coconut water kefir</td>
</tr>
<tr>
<td>Challenge item(s)</td>
<td>1</td>
<td>≥250 Kcalories (from client’s orthorexic food list)</td>
</tr>
<tr>
<td>Eggs</td>
<td>Aim for 3 per week</td>
<td>Include fatty fish such as salmon, tuna and trout. Begin to consider other animal protein sources</td>
</tr>
<tr>
<td>Fish/Seafood</td>
<td>Aim for 3, 3+ oz. servings per week</td>
<td></td>
</tr>
</tbody>
</table>

*The intent is to provide adequate calories and a wide range of nutrients to support full weight restoration while also giving the client control over food choices in an effort to move towards intuitive eating.84,87,92

Table 3. Sample One-Day Menu*

<table>
<thead>
<tr>
<th>Time</th>
<th>Options</th>
</tr>
</thead>
</table>
| Breakfast  | • Fruit-yogurt parfait: layers of homemade yogurt, fruit (berries and banana) and oatmeal/walnut/flax & chia seed granola  
               • Hot green tea with honey                                              |
| A.M. Snack | • Challenge item: Medium decaf flavored latte prepared with coconut milk |
| Lunch      | • Mexican wrap: whole-grain or brown rice wrap filled with grilled or blackened seafood (mahi-mahi, salmon, shrimp, cod), avacado/guacamole, tomatoes/salsa, lettuce, chives & cilantro (from culinary garden), yogurt-based or full-fat salad dressing (i.e. chipotle ranch or lime vinaigrette), and grated cheese  
               • Apple slices dipped in almond butter  
               • Kombucha (ginger/peach)                                                      |
| P.M. Snack | • Homemade trail mix (2/3 cup): pistachios or other nuts of choice, coconut flakes, dark chocolate cocoa nibs, and non-heme iron rich food (raisins, prunes or dates) |
| Dinner     | • Quinoa tabbouleh with feta cheese on mixed bed of greens  
               • Sourdough bread dipped in olive oil, n-3-fortified dressing or spread with nut butter  
               • Grapes  
               • Decaf coffee with vanilla coconut/almond milk                                   |
| HS Snack   | • Hummus and either pita chips, corn tortilla chips or nut thin crackers  
               • 4 oz. pineapple juice with 1 TBSP psyllium husk and additional 8 oz. water |

*Client & RDN created menu based on patient preferences and current symptomatology—anxiety, modest weight restoration without noteworthy GI complaints.
Microbes at the Table: References


34. Brown KM, Bujac SR, Mann ET,


71. Kennedy PJ, Murphy AB, Cryan JF, Ross PR, Dinan TG, Stanton C.


Instructions for Completing the CPE Activity for Credit

1) Read the Continuing Professional Education article and answer the associated quiz questions. For each question, select the one best response. Compare your answers to the answer key on this page.

2) Send your completed quiz and application for CPE credit by email or mail to: Shari Pollack, MPH, RDN, LDN
4500 Keeney Street, Skokie, IL 60076 sbethp@gmail.com.

This activity has been approved for 1.5 hours of CPE credit. You will be notified if hours are not approved.

Suggested Performance Indicators: 8.1.5, 9.3.2, and 10.4.4.

Questions:

1. How do prebiotics work?
   A. They serve as precursors to gamma-aminobutyric acid (GABA)
   B. They stimulate the growth and activity of probiotic bacteria
   C. They convert tryptophan and phenylalanine into serotonin and dopamine
   D. They modulate the absorption of omega-3 fatty acids

2. Green and black teas have been shown to do which of the following?
   A. Promote the growth of Bifidobacterium spp.
   B. Act as a precursor to neurotransmitters
   C. Retard the growth of Helicobacter pylori
   D. Increase the production of short-chain fatty acids

3. The study by Armougom et al found which of the following?
   A. No difference in the number and types of fecal bacteria between obese and anorexic subjects
   B. Higher concentrations of Lactobacillus bacteria in anorexic subjects
   C. Higher concentrations of Methanobrevibacter smithii in obese subjects
   D. Higher concentrations of Methanobrevibacter smithii in anorexic subjects

4. Which of the following best describes the gut-brain axis?
   A. A bidirectional pathway between the brain and the enteric nervous system
   B. A barrier regulating the passage of oxygen, nutrients and neurotransmitters into the brain

5. Which of the following plays a role in synaptic plasticity and monoaminergic neurotransmission?
   A. Polyphenols
   B. Probiotics
   C. Omega-3 fatty acids
   D. Prebiotics

Expiration Date: May 15, 2020

Please print or type
Name: ____________________________________________________________________________________
Address: __________________________________________________________________________________
Academy Membership #: __________________________________ Phone: _____________________________
Email Address: _____________________________________________________________________________
DIFM Member: ☐ Yes ☐ No Date Test Completed: ____/____/____

The answer key for the questions: 1. b. 2. c, 3. d. 4. a, 5. c.
Continuing Professional Education Certificate of Attendance
—Attendee Copy—

Participant Name: ________________________________

Registration Number: ______________________________

Activity Title: Microbes at the Table: The Role of the Gut Microbiome and Related
Nutritional Interventions in the Treatment of Anorexia Nervosa

Activity Number: 132837 (Expires 04/01/2020)

Date Completed: ___________ Number of CPEUs Awarded: 1.5

*Suggested Learning Need Code(s): ________________________________

*Suggested Performance Indicator(s): ________________________________

Provider Signature

RETAIN ORIGINAL COPY FOR YOUR RECORDS

*Refer to your Professional Development Portfolio Guide For LNCs or PIs

Continuing Professional Education Certificate of Attendance
—Licensure Copy—

Participant Name: ________________________________

Registration Number: ______________________________

Activity Title: Microbes at the Table: The Role of the Gut Microbiome and Related
Nutritional Interventions in the Treatment of Anorexia Nervosa

Activity Number: 132837 (Expires 04/01/2020)

Date Completed: ___________ Number of CPEUs Awarded: 1.5

*Suggested Learning Need Code(s): ________________________________

*Suggested Performance Indicator(s): ________________________________

Provider Signature

RETAIN ORIGINAL COPY FOR YOUR RECORDS

*Refer to your Professional Development Portfolio Guide For LNCs or PIs

Microbes at the Table: The Role of the Gut Microbiome and Related Nutritional Interventions in the Treatment of Anorexia Nervosa

132837 (Expires 04/01/2020)

1.5

www.integrativeRD.org

Spring 2017 Volume 19, Issue 4 101 www.integrativeRD.org
Blenderized Tube Feeding

Katherine DiGeronimo, RD, LD

Katherine DiGeronimo, RD, LD is the Registered Dietitian for Nutritional Medicinals, LLC. Prior to this, she worked in the clinical nutrition setting, specializing in the pediatric GI population. She is a Certified Lactation Counselor and is currently working towards IFNCP certification through the Integrative and Functional Nutrition Academy. Contact Katherine at katherine@functionalformularies.com.

Introduction

Research continues to show the importance of the food we eat related to various aspects of health including its impact on the prevention of chronic disease, immune function, and obesity, among others. The 2015–2020 Dietary Guidelines for Americans from the USDA emphasizes a diet that is rich in whole foods and there has been a growing movement towards understanding and implementing a whole foods approach to diet.1 This also extends to the community of individuals who require tube feeds as their source of nutrition. Thousands of individuals in the United States require enteral nutrition and millions worldwide, with the number of those who require long-term nutrition support continuing to rise. The global enteral nutrition market was valued at $13 million in 2016 and is expected to grow 5.8% in the next six years.2 Yet the quality of nutrition from standard formula options for those on feeding tubes has been far below the established expectations for healthy individuals who are able to eat orally.3 Over the past decade, this has started to shift due to increasing interest from those in the adult and pediatric tube-fed community to deliver whole foods through the feeding tube—or blended tube feeding.

Blended Tube Feeding: Definition and History

Blended tube feeding—also known as home blended formula, blended diet, or pureed by G-tube—refers to using a blend of foods and liquid that is pureed and given through a feeding tube.4–9 In practice, this can encompass various types of blended diets including: blending table foods with some type of liquid in a powerful blender, commercial baby foods mixed together with milk or other formula as the base, or more recently, commercial food-based formula options.7–9

Though the use of conventional commercial formulas is common practice today, reliance on such formulas has only occurred for a short time relative to the history of enteral feeds.10 Using whole foods to deliver nutrition and foster health was the first method of nutritional support. This dates back to ancient Egypt with accounts of enemas using grains, milk, whey, and wine. It was not until the mid-1900s that this began to shift.6,10 This was largely in part due to the first automated pump in 1940, followed by the development of commercial formulas in the 1950s.4,10 The introduction of commercial formulas was not without debate within the medical community. Some physicians argued that providing mixtures of whole blended foods showed better gastrointestinal (GI) tolerance and were less costly. In opposition to this, commercial formulas were valued for their ease of use, decreased risk of microbial contamination, and exact nutrition information. With more manufacturing of commercial formulas and greater availability of these products in the 1960s and 1970s, the use of blended tube feeds steadily declined.10

Several studies suggest that requests for a blended diet have been increasing in the tube-fed population over the past several years.4,9 One cross-sectional study using a self-reported survey found that a significant percentage of home enteral nutrition patients reported using blended tube feedings in some capacity—65.9% of adult patients and 89.6% of pediatric patients.9 Another survey of pediatric registered dietitians found that 77% reported positive outcomes with blended tube feedings, including improved growth and oral intake. Despite these positive outcomes, the number one reason to initiate blended diets was still largely parental driven. Reasons cited for not using blended diets in clinical practice included risk of bacterial overgrowth, inadequate time to follow-up with patients, and lack of specified nutrient composition in these diets. Twenty-eight percent of those surveyed showed interest in further information on how to implement.5 This can suggest that while interest in blended diets is increasing, there is a need for action in the healthcare community to gain knowledge in this area to help patients and families in their efforts.

Disadvantages

Though most research articles cite the need for further studies on blended diets, there is a growing body of literature that discusses its use and reviews advantages and potential barriers.4–6 It is generally recommended that individuals pursuing a blended diet are bolus fed via a gastrostomy tube that is size 14F or greater. Blending is typically not recommended for continuous feeds since the viscosity is often too thick and can cause clogging issues.4,6–8 A hang time of no longer than 2 hours is recommended due to the risk of microbial activity. Due to the specificity of such recommendations, this can certainly be considered a barrier as it excludes many tube-fed individuals. As later discussed, the presence of commercial food-based enteral products has helped alleviate some of these barriers.

Other potential disadvantages often recognized in the literature include increased labor involved in preparing and administering recipes, especially considering that families are often caring for patients with medically complex conditions. There is also a general concern for improper food handling and subsequent food safety issues. Although for many this would be no different than preparing a family meal safely, it is important to consider the literacy of the family or caregiver in implementing a labor intensive practice that requires concentration on safe food handling. Another common concern among healthcare practitioners is uncertain nutrient levels, which leaves the potential for macronutrient and micronutrient deficiencies if a nutritionally sound recipe is not in place.4,9 For this reason, it is highly
recommended that a registered dietitian skilled in blenderized tube feeding help implement these diets with close monitoring and evaluation.\textsuperscript{1,6-7} Cost can also be a barrier if families are purchasing their own ingredients out of pocket, as opposed to the potential for insurance coverage of commercial formulas.\textsuperscript{4,7}

Advantages

There are several significant advantages of implementing a blenderized tube feeding. Among the first recognized in many reviews includes the psychosocial benefits.\textsuperscript{1,6} For many families and caregivers, implementing a blended diet can normalize feeding and allows individuals the opportunity to be a part of meal time fellowship.\textsuperscript{6} It can also foster the innate sense of nurturing that comes with preparing and providing meals to loved ones. Included in the psychosocial component of blended diets is the opportunity to provide foods that are in line with nutritional views as well as avoiding ingredients that they may not prefer.\textsuperscript{2,7} This can provide more comfort and confidence in the food they are providing their loved one.

Improved tolerance is also noted. This includes improved GI symptoms, including decreased reflux and constipation, as well as better volume tolerance. Decreased symptoms of retching and gagging have also been shown.\textsuperscript{2,6} Possibly in part due to improved tolerance, studies have shown increased oral intake when on a blended diet.\textsuperscript{3,6}

However, what has been discussed less frequently in reviews of blended diets are the potentially harmful ingredients in conventional commercial formulas and the improved nutritional quality when implementing feedings made from whole foods. The majority of commercial enteral formulas on the market today are largely comprised of inexpensive, highly refined ingredients—including added sugars, heavily processed corn and soy ingredients, vegetable and seed oils, as well as casein. It can be argued that while these formulas are made to meet macronutrient requirements, they do little to support health and potentially drive inflammation, create dysbiosis in the microbiome, contribute to GI distress, and suppress immune function.\textsuperscript{3} Of equal importance are the benefits that whole foods provide. Among the most beneficial attributes of switching to a whole foods formula are (1) vegetable sources of fermentable fiber—fostering healthy gut bacteria, better glycemic control and better digestion; and (2) plant sources of phytoneutrients—with health promoting properties that may be protective against disease, reduce inflammation, and strengthen the immune system.\textsuperscript{3,11-12} Another important distinction is the availability of more microbial accessible carbohydrates (MACs) in blended diets—carbohydrates that can be metabolically used by the microbes in the gut. These carbohydrates feed important families of microbes and promote microbial diversity that evidence suggests can play an important role in improved health outcomes.\textsuperscript{11} With more clinicians realizing the potential for this impact, more studies are being conducted to better understand the merit of whole foods formulas.

Commercial Food-Based Enteral Formulas

There are now commercial food-based formulas available for individuals, families, and caregivers looking to implement a blended diet. This can be especially helpful for those who seek the benefits of whole foods, while also easing the potential difficulty of preparing recipes on their own. Some use these options as their sole nutrition source, while others may use it in combination with their home blends or during special circumstances such as travel.\textsuperscript{8} While each of these products are marketed towards the blended diet community, there are notable differences between them. One such product has been on the market for several years and has recently been slightly reformulated. While it contains certain food ingredients in the form of powders and purees, it also includes ingredients and additives similar to those found in standard formulas.\textsuperscript{14} Another option is comprised of a line of four blends, each of a different variety made of six to eight ingredients. These are not considered nutritionally complete and are intended to be used as a supplement to another formula.\textsuperscript{15} The third option consists of an adult formula that has been on the market for almost 4 years, and a newer pediatric formula that was released within the past year. These products are the only whole foods enteral formulas that are certified USDA organic with no chemical preservatives and no sources of added sugar, in the form of corn syrup, fruit juice concentrates, or brown rice syrup. Both are nutritionally complete in of the number of pouches recommended for different age groups, and are thin enough to be used in continuous feeds, including J-tube feeds. They can also be used as oral meal replacements.\textsuperscript{16}

Conclusion

While concerns still exist among healthcare professionals and further studies are needed, blended tube feedings have the potential to offer tremendous benefits to those medically fragile individuals requiring enteral nutrition. While enteral nutrition support over the past 40 years has largely focused on commercial products, growing interest in blended tube feedings is allowing the tube-fed population the opportunity to benefit from whole food nutrition—in one of the populations who perhaps needs it most.

Dietitians in Integrative and Functional Medicine

A dietetic practice group of the Academy of Nutrition and Dietetics
Blenderized Tube Feeding: References


Featured Educational Opportunity

May 18-20, Plant-Based Prevention of Disease conference. Albuquerque, NM. The fourth annual P-POD Conference brings together 33 expert speakers such as researchers, clinicians, and educators to discuss the latest research on plant-based diets and their effect on prevention and treatment of chronic diseases. T. Colin Campbell, PhD and founder of T. Colin Campbell Center for Nutrition Studies and Plant-Based Nutrition Certificate program, eCornell Inc., will be the keynote speaker for P-POD’S first annual Denis Burkitt Memorial lecture. Up to 17.25 hours of continuing education credits are available for RDNs and NDTRs. For more information, please see www.preventionofdisease.org or contact info@p-pod.org.

This announcement is courtesy of an agreement between P-POD and DIFM.


This course will also be available at other dates and locations:
- September 11-15, Dallas, TX.
- November 12-16, Chicago, IL.

July 8-9, Simply Spicy: An Exploration of Botanical and Culinary Medicine in Integrative Practice. Taos, NM. https://www.imconsortium.org/events/upcoming-conferences/simply_spicy.cfm

July 29-30, Medical Cannabis Conference. Portland, OR. http://career-alumni.nunm.edu/event/2017-medical-cannabis-conference-registration/

Electronic Mailing List (EML)

Recent Topics Review:

In a discussion regarding foods that could block estrogen, responses suggested soy, flax, garlic, onions, cruciferous vegetables, and citrus bioflavonoids from citrus fruits. In a thread on high serum ferritin levels, many members suggested Hashimoto’s disease as being a possible cause. Aside from reducing serum ferritin levels with blood transfusions, avoiding excess iron and supplementation of vitamin C was also suggested. In two separate discussions on colostomies, several members recommended banana flakes to bulk up stool and treat diarrhea. Other popular EML threads included: postpartum hair loss, good sources for nutrigenomics, candida causing celiac disease, and a treatment for MRSA during pregnancy. In our commitment to being fair and unbiased, discussions regarding individuals or organizations, as well as certificate programs, testing, and nutrient analysis programs can be found on the electronic mailing list under: https://groups.yahoo.com/neo/groups/DIFM_Listserv/info.

What’s New - Journal Reviews and Resources

Cardiovascular Mortality and High-Density Lipoproteins in Individuals Without Pre-Existing Cardiovascular Conditions
The Cardiovascular Health in Ambulatory Care Research Team (CANHEART) cohort was used to assess the relationship of mortality and high-density lipoprotein cholesterol (HDL-C) in individuals without pre-existing cardiovascular disease (CVD). The study consisted of 631,762 Ontario residents between the ages of 40 and 105 with the average age being 57.2 years old. The fasting HDL-C was measured one year before the inception date. The sample excluded nursing home residents and any individuals with CVD or comorbidities such as cancer, dementia, peripheral vascular disease, abdominal aortic aneurysm, and venous thrombosis. The outcome measures were cause-specific mortality, including CVD, cancer, and non-CVD and noncancer mortality. The HDL-C relation to each of the three causes of death was estimated using separate cause-specific hazard models for men and women while adjusting for age, income, hypertension, diabetes mellitus, smoking, cholesterol levels, previous comorbidities, and Johns Hopkins’ Aggregated Diagnosis Groups. Subgroups were stratified by association of cause-specific mortality and HDL-C in individuals with low-density lipoprotein cholesterol (LDL-C) varying from ≤ 100 mg/dl to > 100 mg/dl, those older than 66 who were eligible for or using statins one year before inception, and individuals with a body mass index higher or lower than 25 kg/m². The Canadian Community Health Survey (CCHS) was used for participants to self-report their help status, health determinants, and utilization of healthcare. Among the 5,108 participants who completed the CCHS, there was a strong correlation between higher HDL-C levels and healthier lifestyle factors. Individuals with higher HDL-C levels showed a higher prevalence of BMIs lower than 25 kg/m², moderate physical activity (walking 30 minutes or more a day), and daily consumption of five or more servings of fruits and vegetables. The study found a high correlation between lower HDL-C levels and lower socioeconomic status, unhealthy lifestyles, increased CVD risk factors, and increased prevalence of medical comorbidities.
While lower HDL-C levels were found to be associated with an increased risk of both CVD and non-CVD mortality, individuals with very high HDL-C levels were associated with an increased risk of non-CVD mortality. Due to the similarities in the association of HDL-C levels and non-CVD mortality, HDL-C is unlikely to be a determinant of CVD-specific risk factors.


Effects of Yoga and Lifestyle Modifications on Blood Pressure

Authors conducted a study comparing the effects of yoga on the average 24-hour ambulatory blood pressure (ABP) among adults with prehypertension or stage one hypertension over a 24-week period. A total of 137 participants were randomized into three intervention groups: the structured yoga program (YP), the blood pressure education program (BPEP), and the combined yoga and education intervention (COMBO). The YP consisted of 12 weeks of biweekly yoga classes and self-practice and then 12 weeks 90-minute yoga classes, as well as 90-minute at-home yoga sessions. The BPEP intervention was comprised of 12 nutrition classes, 12 motivational experiences, small-group health education classes, and a walking program which consisted of 180 minutes walking each week, ideally over six days, or approximately 10,000 steps per day. Participants in COMBO program took part in two yoga classes each week, the biweekly nutrition lecture, and the walking program. ABP was measured at baseline and weeks 12 and 24. From weeks 0-12 and 0-24, there was a significant decrease (1.1 mm Hg) in systolic blood pressure (SBP) and diastolic blood pressure in all three intervention groups. By week 12, the YP and COMBO group showed a greater decrease in SBP, however, by week 24, the BPEP was shown to have a slightly higher reduction in SBP. Based on this study, the effects of yoga on ABP were found to be similar to both the diet and exercise group and the combination intervention.


Reduction of Preoperative Anxiety in Breast Surgery Patients with Aromatherapy

The association of anxiety and aromatherapy using lavender fleur oil (LFO) and unscented oil (UO) was observed in 93 women just prior to undergoing breast surgery. The purpose of this study was to determine if use of LFO aromatherapy would have any reduction on preoperative anxiety. The women were randomized into two groups of either the lavender fleur oil or unscented oil. Before and after aromatherapy treatment, which took place immediately before surgery, vital signs (blood pressure and heart rate) were taken and the participants completed the Spielberger State Anxiety Inventory (STAI) questionnaire. The STAI questionnaire allowed the responses as being either positive or negative emotions. Patients received treatment by wearing a plastic oxygen face mask for 10 minutes which contained either 2 drops of 2% LFO or UO inside. Both groups scored significantly higher (P ≤ .003) for positive feelings on the STAI questionnaire after treatment. The LFO group had a stronger effect, with scores that were slightly, but significantly more positive (P ≤ .001) than those of the UO group. The LFO and UO groups both decreased feelings of jittersness, tension, and of being frightened or worried, however, neither decreased any feelings of confusion or being upset. While the STAI scores did show a decrease in anxiety, there was no significant change in heart rate or blood pressure after LFO or UO treatment. Both treatment with LFO and UO demonstrated the ability to reduce pre-operative anxiety, however, this is likely due to both the aromatherapy of LFO and placebo effect of the UO.


Nutritional Genomics Research Publications – Feb 1, 2017

High-saturated-fat diet increases circulating angiotensin-converting enzyme, which is enhanced by the rs4343 polymorphism defining persons at risk of nutrient-dependent increases of blood pressure. J Am Heart Assoc. 2017;17;6(1). pii: e004465. doi:10.1161/JAHA.116.004465. (PubMed ID: 28096099)

Angiotensin-converting enzyme (ACE) is involved with blood pressure regulation. When subjected to a high-saturated-fat diet, those subjects who carried two copies of the rs4343 variant (GG) allele of the ACE gene showed a significant increase in systolic blood pressure.


Among the postmenopausal Caucasian women studied, the rs11185644 variant near the RXRA gene was associated with dose-response for supplemental vitamin D. Also, five variants in the CYP2R1 gene, and 6 variants in the GC gene were found to be associated with baseline serum levels of 25-hydroxyvitamin D3, a metabolite of vitamin D.


Aging-related disorders are discussed in relation to various "omics" technologies, including nutritional genomics. The authors suggest that personalized nutrition, together with corresponding lifestyle changes, will become increasingly important for both preventive and therapeutic strategies.

Among the Iranian subjects tested, obese subjects with 2 copies of the T allele (TT) of the rs10811661 variant had a significantly less favorable, higher-risk cardiovascular profile than those with the CT or CC alleles. However, this elevation in risk profile was mitigated among those with lower body mass index (BMI). Thus, for obese subjects with the TT allele, a low-calorie diet combined with greater physical activity could be especially helpful for reducing cardiovascular risk.

The roles of PPARs (PPARA, PPARB and PPARG) in regulating white, brown, and beige adipose tissues are discussed. Table 3 lists various flavonoids that have been studied in relation to PPARs, and specific variants of PPARG are discussed in more detail.

Table 1 provides a summary listing of genes and gene variants that have been associated with blood levels of vitamin E and its bioavailability.

The rs7903146 variant of the TCF7L2 gene is shown in this report to interact with obesity status with regard to their combined influence on the risk of developing type-2 diabetes. Awareness of such interactions will lead to greater accuracy of risk predictions.

This review discusses the influence of epigenetics on Alzheimer-related gene expression, which includes environmental influences. DNA methylation, histone modifications, and microRNAs are discussed, along with risk-modifying factors such as heavy metals, alcohol, trace elements, vitamins, and omega-3 fatty acids. Botanical constituents such as resveratrol, oleuopein, curcumin, etc., are also described.

The influence of various botanical constituents on gene expression related to cardiovascular risks are reviewed. Discussion includes flavonoids (e.g., anthocyanins, flavanones, flavanols, and flavonols), phenolic acids, and stilbenes.

Copyright © 2017 Nutrigenetics Unlimited, Inc. Inquiries about above references? Contact Ron L Martin, MS, President, Nutrigenetics Unlimited, Inc., ron@nutrigenetics.net. The database at http://nutrigenetics.net/ is available to the public free on weekends (U.S. Central time) by using Free as the username, and Weekends as the password, as shown on the login page at https://nutrigenetics.net/Login.aspx. Check out http://www.nutritionandgenetics.org/ to learn more about ISNN membership discounts for dietitians, which includes 24/7 database access plus a subscription to the Journal of Nutrigenetics and Nutrigenomics.

Members in the News

DIFM Media Chair Michelle Loy, MS, MPH, RDN, CSSD was awarded "Outstanding Board Member" for the 2016-17 year by the Orange District of the California Academy of Nutrition and Dietetics. Michelle Loy is serving as Communication Chair and Website Coordinator of the Orange District. Michelle was recently awarded “Outstanding Board Member” during the 50th year of the Orange District. Michelle positively transformed the communications and the website of Orange District. She is a dedicated and talented professional with multiple responsibilities and still able to manage those commitments in an organized way.

Advance your NUTRITION PRACTICE with the pillars of integrative & functional nutrition.

Complete the Online Integrative and Functional Nutrition Certificate of Training Program!

Dietitians in Integrative and Functional Medicine
a dietetic practice group of the Academy of Nutrition and Dietetics

Visit integrativeRD.org to learn more!
IFM Network Chair, Mary Therese Hankinson, MBA, MS, RD, EDAC, CTP, holds the position as the Director of Office of Patient-Centered Care/Planetree Office of the Veteran Affairs New Jersey Health Care System (VANJHCS). Planetree is a non-profit organization that gives hospitals and healthcare facilities the support needed to integrate holistic approaches into various clinical settings all over the world. The Planetree organization helps transform traditional healthcare settings by sharing their philosophies on patient-centered care and helping to facilitate the development of a healing environment. In 2005, Mary Therese led the VANJHCS to become an affiliate with Planetree to bring the body, mind, and spirit approach to improve patient-centered care.

A core component of the Planetree model involves implementation of integrative therapies. During the initial phases of implementation, VANJHCS was successful in the implementation of integrative therapies as providers with allopathic and integrative credentials served as clinical champions and incorporated the practice of integrative medicine into their work at the VA. For example, Mary Therese worked with Doreen Korn, RN, MA, AHN-BC, QTP, HWNC-BC, an advanced practice holistic nurse, who taught nursing staff to incorporate holistic practices such as therapeutic touch to help patients heal faster. The new approach also brought about more opportunities to implement yoga therapy and mindfulness practices for patients with chronic pain and behavioral health diagnoses.

In 2011, Mary Therese and her staff collaborated with nursing to implement a Sleep Menu, thereby building on the previous campaigns to reduce noise and promote a quieter healing environment. Similar to the previous noise reduction projects, it relied heavily on staff to be mindful of their work behavior and to internalize the importance of sleep and quiet as a necessary ingredient for patient healing.

The Sleep Menu today offers the following items for sleep promotion and veteran preference:

- Aromatherapy with lavender infused essential oil aromatabs
- Ear plugs
- Eye mask
- Herbal chamomile tea
- Soothing music and nature scenes via the interactive patient system and cable television; 3 channels provide light jazz, classical or sonic Zen music
- Warm blanket
- Warm milk upon request.

During 2011, the VA implemented a national office of Patient-Centered Care & Cultural Transformation (OPCC&CT) to build a proactive and personalized patient-centered health care system to empower veterans to achieve their greatest level of health and well-being. OPCC&CT advertised requests for patient-centered proposals and Mary Therese wrote a grant in collaboration with Rutgers University Cooperative Extension of Essex County and VANJHCS to fund the creation of one greenhouse at the East Orange Campus of the VANJHCS. This complemented a burgeoning integrative environment by giving patients the opportunity to grow various anti-inflammatory foods and incorporate them into different menus, thus enabling them to create their own healthy meals. Additionally, this grant also provided funding for veterans to take part in a compensated work therapy (CWT) program in sustainable landscaping and storm water management.

Through their participation in this program, veterans created an on-site storm water management system, which uses water from runoff to produce local, sustainably-grown vegetables and herbs. This program gives veterans the opportunity to learn the therapeutic value of organic gardening, reduce stress, and enjoy their surroundings.

Mary Therese collaborates with Nancy Ann Cotter, MD, CNS, FAAAPMR, FACN, Physician Lead for Integrative Medicine at the VANJHCS, to enrich health care professionals on the scientific evidence of the benefits of anti-inflammatory foods, herbs, and spices on pain reduction and chronic inflammatory diseases. Dr. Cotter and one of the VANJHCS dietitians educate patients on foods and herbs that have natural anti-inflammatory effects on the body. Additionally, through a grant written by Mary Therese, the East Orange Campus of the VA will be opening a culinary kitchen this year where patients can obtain cooking classes within the health care system. Food production employees received health-supportive culinary education to make the connection between healthy whole-foods and functional nutrition. VANJHCS dietitians wrote a grant to implement Healthy Teaching Kitchens within Nutrition and Food Service at the East Orange and Lyons campuses. The Healthy Teaching Kitchen program provided interactive cooking demonstrations to veterans and their families. These VA Healthy Teaching Kitchens focus on disease-specific diets and sites with their own gardens incorporate their own locally grown foods into the cuisines. One and a half years ago, the VANJHCS also developed a holistic pain management program to decrease the use of opioids by using non-pharmacological integrative approaches including acupuncture, nutrition, mindfulness and yoga. In 2005, Planetree laid the groundwork and shortly after, under the leadership of Mary Therese, the VANJHCS was able to achieve Planetree Silver Merit Recognition in Patient-Centered Care. The model implemented by the VA Office of Patient-Centered Care and Planetree provides frameworks for facilities to initiate the use of integrative practices and identify credentialed integrative practitioners. Through Mary Therese’s diligence with Planetree, the VANJHCS is continuously growing as a true patient-centered, integrative environment that touches many veterans’ lives and demonstrates increased patient and employee satisfaction as well.
Nutrient Power: Heal Your Biochemistry and Heal Your Brain

William J. Walsh, PhD
Softcover: $13.01

As advances in science and technology continue to emerge in the field of nutritional genomics, a new era of disease prevention is rising in our healthcare system. In Nutrient Power: Heal Your Biochemistry and Heal Your Brain, Dr. William Walsh presents natural treatment systems for individuals diagnosed with mental disorders, including schizophrenia, depression, autism, behavioral disorders, ADHD, and Alzheimer’s disease. A valuable resource for physicians, psychiatrists, pharmacists, clinical researchers, and dietitians, this book provides an important analysis of current therapies used for mental disorders and the role that nutrient therapies can play in treating and preventing disorders. Walsh views psychiatric medications as unsustainable treatments to help individuals with mental disorders, since they often provide only partial benefits to patients and can cause unpleasant side effects. He emphasizes that medications are essentially “foreign molecules” that create abnormal conditions in the body, whereas nutrient therapy can normalize brain chemistry. Moreover, he believes that nutrient therapy will eventually replace psychiatric medications as a method of treatment.

Walsh states that genetic and environmental factors can produce nutrient imbalances in the brain, which can result in a myriad of mental disorders. These nutrient imbalances can cause improper concentrations of key neurotransmitters, alter gene expression of proteins that govern neurotransmitter activity at synapses, and can lead to impaired protection against toxic metals in the brain. Using blood, urine, and tissue tests, nutrient imbalances can be identified and targeted for nutrient therapy. Nutrient therapy can stabilize nutrient concentrations required for proper neurotransmitter synthesis, modify epigenetic regulation of neurotransmitter activity, and reduce oxidative stress caused by free radicals.

As a scientist with a doctorate in chemical engineering, Walsh has spent over thirty years studying more than 30,000 patients with different mental disorders. To support his theories related to underlying nutrient imbalances and effective therapies, he uses his own quantitative data, which includes over 3 million chemical assays in a variety of patients, including serial killers, autistic children, and Alzheimer’s patients. Additionally, he uses data from other researchers and historical accounts from patients and their families.

The structure of the book gives the reader a foundation of brain chemistry and how intertwined nutrients are in the functioning of the brain. Walsh provides an overview of biochemical individuality and mental health, an introduction to brain chemistry, the role of nutrients in mental health, epigenetics and mental health, individual mental disorders, and clinical application of nutrient therapies. For each mental disorder discussed, Walsh reviews background information and history of the disorder, biotypes within each disorder, symptoms and traits of each biotype, nutrient therapies for each biotype, example case studies to demonstrate the clinical application of nutrient therapies, current psychiatric medications for each disorder, and the future of nutrient therapies and medication for each disorder.

Although he provides compelling arguments for the nutrient imbalances identified with each mental disorder and has demonstrated effective nutrient treatments for each imbalance, further research is required for this to be clinically applicable nationwide. Walsh does not claim that his nutrient therapy approach definitively works for every patient, but he openly discusses the reports from patients, patient family members, and physicians. For integrative RDNs taking a holistic approach to nutrition and medicine, this book can be a valuable resource that personifies the essential role of nutrients in brain chemistry and in the treatment of mental disorders.

Reviewed by Kathleen Walters, dietetic intern at Virginia Tech University. Kathleen earned her BA in Political Science and Spanish from the University of Notre Dame in 2008 and BS in Food and Nutrition from the University of Alabama in 2015. She is passionate about nutritional genomics, food policy, and nutrition education and promotion. Kathleen can be reached via email at kwalter5@vt.edu.

Dietitians in Integrative and Functional Medicine
a dietetic practice group of the Academy of Nutrition and Dietetics

www.integrativeRD.org
Nutrition Essentials for Mental Health

Nutrition Essentials for Mental Health: A complete guide to the Food-Mood Connection, written by Leslie Korn, PhD, is written to be a comprehensive text for professionals in the mental health field including psychiatrists, psychologists, and medical doctors who may have received little, if any, nutrition education. Dr. Korn holds a PhD in Behavioral Medicine, an MS in Public Health from Harvard and an MS in Health Psychology. Dr. Korn conveys the philosophy that the key to mental health lies within the power of nutrition. She states, “Nutrition matters and is the most important missing link to mental health in society today.” Dr. Korn stresses the importance of scope of practice, laws, and competence among providers and includes details on how to develop that competence. She discusses potential legal issues, rules, and legislation regarding the practice of medical nutrition therapy, and encourages anyone interested in incorporating nutrition into their practice to review their own state laws prior to proceeding.

In the first chapter, Dr. Korn begins by stating her case as to the importance and role of nutrition in mental health. She starts with the basics: what information to collect on a nutrition assessment and how to interpret it (complete with a sample intake form), the anatomy of a food diary, and samples of motivational interviewing dialogues. Her writing style is straight-to-the-point and she effectively translates what can be complex scientific material into easy-to-understand and digestible bits. She tackles topics such as adrenal support, genetics, food sensitivities and inflammation using analogies and simple examples.

Overall, Dr. Korn thoroughly cites well-respected scientific journals to support the use of various nutrition approaches for mental health conditions such as bipolar disorder, eating disorders, substance abuse and addiction, schizophrenia, autism, anxiety, and attention-deficit disorder. In fact, sixteen pages are dedicated to references from well-respected sources such as the Journal of Clinical Nutrition and the Journal of the American Medical Association. However, in several instances, Dr. Korn neglected to cite research to support certain areas of practice. For example, she encourages providers to utilize methods to determine a client’s “metabolic type” using niacin and vitamin C. Dr. Korn states that these supplements can be used to determine a client’s rate of oxidation, which then indicate their metabolic type. She follows with specific percentages of protein, carbohydrates, and fat that clients should aim for based on their rate of oxidation. Upon emailing Dr. Korn to request the references that show the validity of such testing, she was unable to provide any well-documented research, but did point to other doctors that use the protocol she recommended.

The advanced integrative RDN may find the majority of the material basic. As the book lends itself to more of a textbook approach, she spends considerable time defining concepts and diseases that are part of standard training for RDNs. She devotes an entire chapter to the basics of mental health diagnoses such as anxiety, substance abuse, dementia, and eating disorders. In other chapters, she covers food allergies, sensitivities and special diets, and nutrients in specific foods to treat or support various conditions.

While much of the material may be familiar, Dr. Korn has successfully consolidated the information into detailed and easily-referenced protocols. This book may be a comprehensive, introductory reference manual to have on hand and could be especially relevant for RDNs new to the area of functional and integrative nutrition.

Reviewed by Amber Gourley, MS, RDN, LDN, CLT, CDE. Amber received her master’s degree in Clinical Nutrition from East Tennessee State University during her dietetic internship in 2013. She currently works full-time at the Mountain Home Veterans Affairs Hospital. Amber also operates a small private practice, The Disobedient Dietitian, where she challenges conventional approaches to nutrition and body image and utilizes the principles of functional and integrative nutrition to change people’s health and lives. Contact Amber at www.thedisobedientdietitian.com or at ambergourleyrd@gmail.com.

Dietitians in Integrative and Functional Medicine
a dietetic practice group of the Academy of Nutrition and Dietetics
Throughout history, essential oils (EOs) have been cultivated from plants and used around the world for their various properties. Today, integrative and functional medicine dietitians can use EOs as another tool to encourage a more natural approach to health and healing. This fact sheet summarizes the potential attributes of three edible EOs, each of which are FDA approved for internal consumption.

History of EOs
For centuries, the therapeutic, antimicrobial and antiseptic properties of plants have been used throughout the world. Today, with a noticeable rise in drug-resistant pathogens, the various healing aspects of these EOs have become a prevalent topic of modern day research. EOs, also known as volatile oils, are extracted from plants and contain concentrated amounts of various phytochemicals and compounds. The mechanisms of action of EOs are dependent upon environmental factors and specific chemical compounds of the plant from which they were extracted. As the strength and concentration of these compounds is highly potent, dosage is under constant debate.¹

While most EOs are used for their aromatic properties, there are a few EOs acknowledged as Generally Recognized As Safe (GRAS) by the FDA for internal consumption. To avoid toxicity, carefully follow the directions on purchased oil containers before consuming.

Edible Essential Oil Description

<table>
<thead>
<tr>
<th>LEMON GRASS OIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific Name: Cymbopogon citratus</td>
</tr>
<tr>
<td>Lemon grass (Stapf) is within the Gramineaceae plant lineage and is native to southern India and southeast Asia.³</td>
</tr>
<tr>
<td>Lemon grass is currently cultivated globally within tropical and semi-tropical regions for various purposes including culinary flavoring.⁴</td>
</tr>
<tr>
<td>Lemon grass EO has a citrus flavor and can be used in Asian inspired cuisine, soups, teas, and curry dishes.⁴</td>
</tr>
</tbody>
</table>

Key Constituents

| The EO of Cymbopogon citratus is extracted from the whole aerial leaves on the plant through distillation.³ |
| Lemon grass EO is composed of various hydrocarbon terpenes, alcohols, esters, ketones, and aldehyde compounds ⁴ as well as various phytochemicals including alkaloids, flavonoids, terpenoids and tannins.³ |
| Specifically, the oil contains the phytoconstituent citral (about 70%)³ as well as citronellal, geraniol, terpinolene, geranyl acetate, and myrcene.⁴ |

Holistic and Healing Functions

Lemon grass EO has proven to contain antibacterial, anti-inflammatory, and antioxidant activities.³ These properties can be used to remedy headaches, fever, muscle cramps, and boost overall health.⁴

Studies have reported evidence demonstrating lemon grass’s anti-diarrheal activity,⁵ which can be used to treat gastrointestinal and digestive issues by relieving abdominal cramping and flatulence, as well as improving digestion.³

Various studies involving animal testing have shown evidence of anti-diabetic, chemopreventive, and cytotoxicity properties,⁵ as well as potentially positive hypocholesterolemic, hypoglycemic and hypolipidemic effects.⁶ Specifically, a study involving rats showed decreased levels of total cholesterol, fasting glucose, triglycerides, LDLs and VLDLs using a lemon grass EO treatment.⁴

Mikayla Cupp is a senior at the University of Kentucky with a major and interest in dietetics. She is an executive committee member for the SSTOP Hunger (Sustainable Solutions To Overcome Poverty) student organization on her university’s campus, as well as a community volunteer for various, local affiliations within Lexington, Kentucky. Contact Mikayla at mikayla.cupp@uky.edu.

Potential Risks: Based on a study involving rats, a suggested limit of 0.7 mg/kg/day of the EO has been suggested for human consumption. Those who are pregnant and/or breastfeeding should avoid usage, as the components citral and myrcene induced maternal complications in recorded rat studies.⁶
### Edible Essential Oil Description

<table>
<thead>
<tr>
<th><strong>PEPPERMINT OIL</strong></th>
<th><strong>BASIL OIL (SWEET)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific Name: <em>Mentha × piperita</em> L. &lt;br&gt;Peppermint is part of the Lamiaceae plant lineage and is a hybrid of water mint and spearmint.³ Peppermint is commercially grown throughout North America, Asia, and Europe and the EO functions mostly for medicinal purposes.³ Peppermint EO has a strong mint flavor and aroma and is commonly used for culinary flavoring in teas, baked goods, desserts, and candies.</td>
<td>Scientific Name: <em>Ocimum basilicum</em> L. &lt;br&gt;Sweet basil is a culinary and aromatic herb within the Lamiaceae plant family, cultivated within the subtropical and tropical areas of South America, Asia, and Africa.¹ Basil has a distinctive sweet, yet savory taste including hints of mint and pepper. This EO can be used to add flavor to a multitude of culinary dishes including soups, fish, pasta sauce, and salad dressings.</td>
</tr>
<tr>
<td>Peppermint EO is extracted from flowering aerial leaves on the plant through distillation in the spring months.² The peppermint plant contains over 40 chemical compounds.² Key constituents of peppermint EO include mainly menthol (35-55%) and menthone (10-40%), as well as flavonoids, phenolic acids, and triterpenes.²</td>
<td>Basil EO is extracted from the aerial flowering plant leaves through distillation.³ The main constituents of sweet basil’s EO are found within the basil leaves³ and include estragole, linalool, methyl chavicol, citral, and thymol.³</td>
</tr>
<tr>
<td>Peppermint EO has digestive and antispasmodic properties that help to relax the gut muscles and increase the flow of digestion.² The EO may improve gastrointestinal issues including abdominal pain, indigestion, IBS, nausea, vomiting and bloating.³ Studies suggest peppermint EO has strong antibacterial activity, acting as an inhibitor of various strains of bacteria, including <em>Staphylococcus</em>.² A research study produced in 2014 provided evidence that the ingestion of 50 µl of peppermint oil improved athletic performance regarding strength and speed.² Other studies have concluded choleretic, carminative, antiviral, antioxidant, anti-inflammatory, analgesic, and vasodilator effects,⁷ as well as anticancer activity.⁸</td>
<td>Basil EO can be used as treatment for symptoms including coughing, cephalgia, diarrhea, constipation, and indigestion.¹ The antibacterial activity of basil EO has been correlated to the high amounts of linalool and estragol components it contains.³ These antibacterial functions were proven specifically in one study, providing resistance to clinical isolates of <em>E. coli</em>, <em>K. pneumonia</em>, <em>P. aeruginosa</em>, and <em>A. baumannii</em>.¹ Antimicrobial properties of basil EO have been proven in studies, specifically against strains of <em>Staphylococcus</em> spp., <em>Bacillus subtilis</em>, <em>Listeria</em> spp., <em>Salmonella</em> spp., and others.¹ Other studies have supported this oil’s anti-inflammatory, antioxidant, and analgesic effects.¹</td>
</tr>
</tbody>
</table>

### POTENTIAL RISKS: Peppermint oils containing more than 1% concentration of pulegone are considered toxic and should be avoided.⁹ Those experiencing gastric ulcers or heartburn should avoid use due to the oil’s ability to decrease esophageal pressure.¹⁰ Pregnant and/or breastfeeding women as well as those with known peppermint allergies should avoid use. |

### POTENTIAL RISKS: Breastfeeding women should avoid consumption of basil EO due to the high amounts of estragole present and the lack of information available regarding this component.¹¹

---


Recipe: Chicken and Broccoli Pasta with Pesto

Kathleen Walters is a dietetic intern at Virginia Tech University. Kathleen earned her BA in Political Science and Spanish from the University of Notre Dame in 2008 and BS in Food and Nutrition from the University of Alabama in 2015. She is passionate about nutritional genomics, food policy, and nutrition education and promotion. Contact Kathleen at kwalter5@vt.edu.

Prep Time: 10 minutes
Cook Time: 15 minutes
Total Time: 35 minutes

Serves: 4

Ingredients
- 1 lb whole-wheat penne
- 2 tbsp basil oil*
- 1 lb chicken breast strips
- 1 lb broccoli florets
- 4 tbsp oregano
- 2 tsp pepper
- 8 Roma tomatoes, sliced
- Pesto sauce:
  - 2/3 cup basil oil*
  - 1/4 cup pine nuts
  - 10 basil leaves
  - 1/2 cup parmesan cheese, grated
  - 2 cloves garlic, minced

Directions
1. Prepare the pesto sauce by adding the oil, nuts, basil leaves, cheese, and garlic to a food processor. Pulse until mixture is smooth and creamy. Set aside.
2. Bring 2 quarts of water to boil. Cook the penne pasta for 8-10 minutes until desired tenderness.
3. While pasta cooks, heat oil in a large skillet. Add the broccoli florets and cook (covered) for 2 minutes. Add chicken strips, oregano, and pepper. Cook for 5 minutes, stirring occasionally. Add Roma tomatoes and cook (uncovered) for 2 minutes. Remove from heat.
4. Once pasta has reached desired tenderness, rinse under cold water and drain.
5. Add pasta and pesto to the skillet. Stir until blended and serve immediately.

*“Basil oil” refers to the mixture of basil essential oil with a carrier oil, such as sunflower oil. The number of drops will depend on the oils used and flavor desired. For this recipe, start with one drop of basil essential oil and one drop of lemon essential oil added to 2/3 cup of sunflower oil. Add drops, one at a time, to taste.

Be advised that basil essential oil is very strong and should be added in small increments. Before using essential oils in recipes, verify that they are marketed as safe for internal consumption.
What Members Are Saying About the Online Certificate of Training Program

I just completed the first module last week. I appreciated having a broad overview and insight into how I can...and already am...providing integrative care to my patients. Thanks!!! – Michelle McQueen, RD, CD

I completed the entire course, all 5 modules. I loved it and learned so much. I would have liked a little more info on the best anti-inflammatory diet, maybe some patient handout type things as well as the dosing on some of the herbs like turmeric. Also would be nice to have a follow up course on reading the different lab tests that are out there like ALCAT. – Amy Hansen Hammons, MS, RD, LD

I'm almost finished! So far it has been really good. Very detailed info on metabolic pathways, etc. May have to go back through it more than once. Would love to have flyers or something on all the different 5R regimens. – Lisa Upchurch Wiggins, RDN with MEd in Exercise Physiology

Most beneficial CEU program I've completed in 7 years as an RDN. Would love to see a second level certificate with even more in depth info and practice pearls. – Kodi Watson, MS, RDN, LD

I have completed first 2 rounds and I am really enjoying it. I would love case studies for each module that tie the information all together. – Kerry Barbera, RDN, LDN

YourPlate Contest Winner

Thank you so much! The meal was lightly sautéed salmon marinated in turmeric, sodium free herb blend, salt and pepper. I made some oven roasted Brussels sprouts and baby squash lightly tossed in olive oil and salt for the veggie side. Salad was a broccoli and cabbage slaw with kale, pumpkin seeds, and dried cranberries with a lemon juice and olive oil dressing. Winning this membership is very exciting for me since it gives me the opportunity to learn from the best in the field. This field is definitely an area of dietetics that I'm super passionate about and I am really interested in learning more! Thank you again for this opportunity. Saghar Sefidbakht, MS, RD

Saghar Sefidbakht MS, RD

Hey RDNs! What Does YourPlate Look Like?

Check in with Facebook regularly for our next contest.

Dietitians in Integrative and Functional Medicine

a dietetic practice group of the Academy of Nutrition and Dietetics

eat right®
As the end of my time as chair approaches, I have been reflecting on DIFM’s key projects and the exciting achievements we have made this year—not least of which was the launch of the Certificate of Training in Integrative and Functional Nutrition this past February! This five module, 10 CPE series is available through the Academy’s Center for Lifelong Learning and is a bargain at $24 per module for Academy members. This series provides an excellent overview of the science and philosophy behind Integrative and Functional Nutrition (IFN), including practices that are considered emerging and many that are well established. The project has been two years in the making and has been carefully vetted by the Dietetics Practice Based Research Network (DPBRN), the Center for Lifelong Learning and DIFM. Please help us spread the word about this exciting educational opportunity and consider completing the modules for yourself! They can be found at the Academy eatright.org store.

We have two large and important projects underway that will help define the practice of IFN and promote greater understanding and acceptance among dietitians and other healthcare professionals.

- Our standards of practice and standards of professional performance (SOP/SOPP) are currently being updated with the help of IFN experts Diana Noland, RDN, MPH, CCN and Sudha Raj, PhD, RDN, FAND. We are grateful for their contributions and efforts. This project is being managed through the Practice Standards and Quality Assurance Team at the Academy and will be published in the Academy journal.

- The Role Delineation and Decision Making Frameworks for Integrative and Functional Medicine RDNs research project began this winter. Working with DPBRN, research fellow Emily Gooman, MS, RD, LD was hired to work with DPBRN to gather data for this study that will be published in the Academy journal next year.

DIFM has launched a speakers’ bureau/expert database and we encourage you to join! We have many requests for speakers, authors and consultants on IFN and we need to grow this database to meet the demand. You can find the link on our website, integrativerd.org in the members only section.

Last month we were given permission from the Academy to start a state ambassador program in three states—New York, Florida and California. Our hope is to increase our visibility at the state level with meet ups, outreach, and by promoting member connections. If these three states are successful we will be looking to ramp up this program to other states in the coming year.

I want to give a warm welcome and congratulations to our newly elected executive committee members who will be serving you next year. Our chair-elect is Danielle Omar, MS, RDN. As DIFM’s current marketing chair, Danielle has helped to redesign our website and has worked closely with our communications team to improve our social media platforms and blog. She will be a creative and dynamic leader. Our new secretary is Denine Rogers, MS, RDN, LD, FAND. A fellow of the Academy, Denine recently completed a master’s degree in Complementary and Alternative Medicine and a graduate certificate in Herbal Medicine at American College of Health Sciences. Our incoming nominating committee chair is Susan Linke, MBA, MS, RDN, LD, CGP, CLT, an expert IFN dietitian, and well-known and respected LEAP practitioner and mentor. Our nominating committee member is Jessica Redmond, MS, RDN, CSCS, FAND. Jess is a PhD candidate in Science Education at Syracuse University, a certified yoga instructor, and our current secretary, Mary Purdy, MS, RDN is incoming DIFM chair. She is a senior integrative dietitian and trainer at Arivale, with a wealth of knowledge, enthusiasm, and creativity; not to mention experience as a dedicated DIFM leader. I know you will be in good hands with DIFM’s incoming team!

It is an exciting time to be practicing integrative and functional nutrition—interest has never been so high. Our DIFM membership has grown to over 4700 and continues to grow each month. Your membership is important to us, so please make sure to renew this May. As part of your membership you have access to monthly webinars by experts in the field, archived webinars and newsletters, monthly CPE offerings, our electronic mailing list, the Natural Medicines Database, three full text natural medicine journals, FNCE meet-ups including Mind Body Happy Hour and the opportunity to connect with like-minded peers.

In closing, I want to thank our current executive committee and leadership team—you all have been a joy to work with and a true inspiration. Thank you also to our members for your support and engagement. May the bounty of spring rain upon you!

In health and wellness,

Kelly

Chair, Dietitians in Integrative and Functional Medicine
Editor’s Notes

A

s I write this column, I am spending the last few days of a seven-week journey through the Southern Hemisphere—Australia (AU) and New Zealand. Traveling by car through both countries and spending time with locals has called attention to two things: the similarities between these countries in incidence of obesity and chronic diseases; and the extent of unregulated information regarding alternative (as opposed to complementary or integrative) care and nutrition in the public domain.

According to available statistics, the rate of overweight and obesity in Australia has one of the higher in the world at 63.4% of the adult population, an increase of 12% over the past 20 years. The rate in the US has also increased and now 68.8% of adult Americans are overweight or obese with 36.5% obese and one in twenty, extremely obese. There is a plethora of advertisements for treatments for weight loss, just as in the US. Some of them are legitimate while many are not, given that consumers generally want an easy fix without changing their eating and exercise habits. Some treatments may be overseen by a dietitian/nutritionist, while a preponderance are not administered by licensed nutrition or medical professionals.

While the per capita AU Accredited Practising Dietsitians (APDs)—one per 3958 people—and US Registered Dietitian Nutritionists (RDNs)—one per 3646—is similar, one significant difference seems to exist; I observed little reference to APDs in public advertising. Every town or city from several thousand to several million in Australia has store-front nutrition specialists: “Suzie’s Nutrition” or “Miss Nutrition” as real-life examples. It appears that there are self-proclaimed nutritionists “practicing” in local health foods stores or in conjunction with physiotherapists, acupuncturists, or Chinese Medicine specialists. In other cases, local martial arts teachers and massage therapists advertise themselves as specialists in nutrition. In my travels of over 3400 km (over 2000 miles) by car to date, I have seen that many towns have “nutrition advice” offered on main streets sometimes every block, without reference to credentials or APDs. However, I have seen APDs referred to infrequently in magazines and newspapers, while not at all on medical practitioner’s placards advertising dietitian services.

While America has many “alternative practitioners,” the laws in most of the US do not allow for what appears in AU to be blatant advertising, including claims seen in stores, magazines, and with “healthcare” practitioners. As RDNs we favor laws that help protect consumers from being treated and sometimes exploited by those without credentials, often unknowingly and/or out of desperation. Alternative therapies are just that—alternatives to traditional treatment, all too often administered without medical license or credentials. What sets DIFM apart from alternative nutrition providers is that we have the opportunity for certification by knowledgeable, credentialed RDNs who are providing evidence-based information and treatments with an integrative and functional approach. We do not suggest that integrative nutrition and/or medicine is an alternative treatment, rather it is offered to compliment traditional therapies. In the US we also embrace those who may not have RDN credentialing, but have advanced education and therefore evidence-based expertise to offer, for instance those associated with organizations such as the Institute of Functional Medicine.

As a founding member of what is now DIFM, I remain concerned about those with little or no accredited or evidence-based education providing nutrition services to “the masses.” The availability of education with unsubstantiated nutrition information/counseling will remain, but as long as there is the option for reliable evidence-based information from credentialed RDNs, such as DIFM RDNs, the consumer choosing an RDN should be protected from maltreatment.

As we approach the new year for the Academy and DIFM, I sincerely hope that you will renew your membership. We have many exciting plans for offerings in The Integrative RDN that will bring evidence-based nutrition information that you can use to help your patients/clients. As always, please feel free to contact me at peanut70@gmail.com with any questions or if you are interested in writing or assisting with the newsletter. As is customary in Australia, I close with... See Ya!

Sarah

References


Join us on...

Facebook - https://www.facebook.com/integrativeRD/
Twitter - https://twitter.com/integrativeRD

Facebook - https://www.facebook.com/integrativeRD/
Pinterest - https://www.pinterest.com/integrativeRD/
LinkedIn - https://www.linkedin.com/company/integrativeRD
Second Century Vision
A world where all people thrive through the transformative power of food and nutrition

Second Century Mission
Accelerate improvements in global health and well-being through food and nutrition

The past vision statement evolved to describe a future state that we want to help create. It acknowledges that food and nutrition are instrumental ingredients to individual health and societal well-being. Each word was carefully chosen and deliberate:

• World reflects that the Academy is striving for a global impact
• All people acknowledges a broad reach and impact on humanity
• Thrive is a positive verb synonymous with flourish, prosper, advance and succeed
• Food and nutrition are the vehicles by which this change occurs. 

The Academy of Nutrition and Dietetics and our members:

1. Integrate research, professional development and practice to stimulate innovation and discovery
2. Collaborate to solve the greatest food and nutrition challenges now and in the future
3. Focus on system-wide impact across the food, wellness and health care sectors
4. Have a global impact in eliminating all forms of malnutrition
5. Amplify the contribution of nutrition practitioners and advocates

The Second Century mission evolved to focus directly on the outcome of why the Academy exists—to improve health. Again, each word was carefully chosen and deliberate:

• Accelerate improvements in health reflects that the Academy will enable faster or greater progress in being free from ailment
• Global acknowledges that the Academy has a role in influencing health all over the world
• Food and nutrition identifies the mechanism by which health is improved and the particular area of expertise the Academy contributes.

The vision and mission work together: Vision is the future the Academy wants to create. Mission is how we will get there. The five principles for the Second Century are extensions of the vision and mission and are both aspirational and strategic. Principles are core commitments that clarify and help align organizational leadership on a strategic direction. You can learn more about the vision, mission and principles in the Academy’s press release. Also check out the Academy Vision, Mission and Principles video—great for sharing on social media and in your e-newsletters!
POM Wonderful®

100% Pomegranate Juice

Pure 100% Pomegranate Juice

- Every 16 oz. bottle has the juice of 4 pomegranates.
- No added sugars*, preservatives, colorants, or artificial sweeteners.

Antioxidant Superpower®

- Every 8 oz. serving of POM® has 700 mg of polyphenol antioxidants. Antioxidants may help fight free radicals that damage our cells.
- An in vitro study at UCLA found that pomegranate juice has, on average, more antioxidant capacity than red wine, grape juice or green tea[1].

Fuel Your Workout with POM

100% pomegranate juice is powered by unique polyphenols that early research suggests have promising results for muscle strength recovery.

In a 2011 study, a small set of athletic men drank two servings (about eight ounces per serving) of either pomegranate juice or placebo for about two weeks while following their normal diet and weight training routine[2]. After week one, the men completed specific strength exercises at maximum capacity. They drank an additional serving of pomegranate juice immediately after exercising.

The study found that the men who drank pomegranate juice maintained more of their post-exercise arm strength when compared to the placebo group. A similar trend was seen in the knee though it did not reach statistical significance. Although this research is promising, additional clinical research is needed to establish causation and the potential impact of pomegranate polyphenols on exercise.

[1] Seeram et al., 2008

*Not a low calorie food, see nutrition information for sugar and calorie content
# Executive Committee List

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
<th>Email/Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chair 2016-2017</strong></td>
<td>Kelly Morrow, MS, RDN, CD</td>
<td><a href="mailto:kmorrow@bastyr.edu">kmorrow@bastyr.edu</a></td>
</tr>
<tr>
<td><strong>Past Chair 2016-2017</strong></td>
<td>Monique M Richard, MS, RDN, LDN</td>
<td><a href="mailto:mmr2v@mtmail.mtsu.edu">mmr2v@mtmail.mtsu.edu</a></td>
</tr>
<tr>
<td><strong>Chair Elect 2016-2017</strong></td>
<td>Mary Purdy, MS, RDN</td>
<td><a href="mailto:MaryPurdyRD@gmail.com">MaryPurdyRD@gmail.com</a></td>
</tr>
<tr>
<td><strong>Treasurer 2016-2018</strong></td>
<td>Dana Elia, MS, RDN, LDN</td>
<td><a href="mailto:DIFMTreasurer@gmail.com">DIFMTreasurer@gmail.com</a></td>
</tr>
<tr>
<td><strong>Secretary 2015-2017</strong></td>
<td>Jessica G Redmond, MS, RD, CSCS</td>
<td><a href="mailto:jess.g.redmond@gmail.com">jess.g.redmond@gmail.com</a></td>
</tr>
<tr>
<td><strong>DPG Delegate 2016-2019</strong></td>
<td>Mary Beth Augustine, RDN, CDN, FAND</td>
<td><a href="mailto:delegatedifm@gmail.com">delegatedifm@gmail.com</a></td>
</tr>
<tr>
<td><strong>Nominating Committee Chair 2016-2017</strong></td>
<td>Aarti Batavia, MS, RDN, CLT, CFSP, IFMCP</td>
<td><a href="mailto:aartibatavia@gmail.com">aartibatavia@gmail.com</a></td>
</tr>
<tr>
<td><strong>Communications Chair 2015-2017</strong></td>
<td>Malorie R Blake, MS, RDN, LDN, CNSC</td>
<td><a href="mailto:mBlake822@gmail.com">mBlake822@gmail.com</a></td>
</tr>
<tr>
<td><strong>Development Chair 2016-2018</strong></td>
<td>Kristie Finnan, RDN LDN</td>
<td><a href="mailto:kristiefinnan@me.com">kristiefinnan@me.com</a></td>
</tr>
<tr>
<td><strong>DIFM Historian 2016-2017</strong></td>
<td>Kathy Moore, RDN, LD, CCN</td>
<td><a href="mailto:moorenutritiondifm@gmail.com">moorenutritiondifm@gmail.com</a></td>
</tr>
<tr>
<td><strong>Diversity Chair 2016-2017</strong></td>
<td>Rita Kashi Batheja, MS, RDN, CDN, FAND</td>
<td><a href="mailto:krbatheja@gmail.com">krbatheja@gmail.com</a></td>
</tr>
<tr>
<td><strong>Executive Asst/Website Mgr</strong></td>
<td>Amy Jarck</td>
<td>Phone: 800-279-6880 Fax: 877-862-8390 <a href="mailto:info@integrativeRD.org">info@integrativeRD.org</a></td>
</tr>
<tr>
<td><strong>FNCE 2017 Planning Chair</strong></td>
<td>Mary Alice Gettings, MS, RDN, LDN, CDE</td>
<td><a href="mailto:difmma@gmail.com">difmma@gmail.com</a></td>
</tr>
<tr>
<td><strong>FNCE 2017 Planning Vice Chair</strong></td>
<td>Ann Sukany-Suls, M.Ed, RDN, LD</td>
<td><a href="mailto:ann.suls@gmail.com">ann.suls@gmail.com</a></td>
</tr>
<tr>
<td><strong>Marketing Chair 2015-2017</strong></td>
<td>Danielle Omar, MS, RD</td>
<td><a href="mailto:2eatwell@gmail.com">2eatwell@gmail.com</a></td>
</tr>
<tr>
<td><strong>Member Services Chair 2016-2018</strong></td>
<td>Jacqueline Santora Zimmerman, MS, RDN</td>
<td><a href="mailto:jacq.zimmerman@gmail.com">jacq.zimmerman@gmail.com</a></td>
</tr>
<tr>
<td><strong>Mentor/Coaching Chair 2015-2017</strong></td>
<td>Lesli Bitel-Koskela, MBA, BS, RDN, LD</td>
<td><a href="mailto:Leslibitelk@gmail.com">Leslibitelk@gmail.com</a></td>
</tr>
<tr>
<td><strong>Network Chair 2016-2018</strong></td>
<td>Mary Therese Hankinson, MBA, MS, RD, EDAC, CTP</td>
<td><a href="mailto:mthank@aol.com">mthank@aol.com</a></td>
</tr>
<tr>
<td><strong>Newsletter Editor 2016-2017</strong></td>
<td>Sarah Harding Laidlaw, MS, RDN, MPA, CDE</td>
<td><a href="mailto:peaknut70@gmail.com">peaknut70@gmail.com</a></td>
</tr>
<tr>
<td><strong>Newsletter Copy Editor 2016-2017</strong></td>
<td>Emily D. Moore, MS, RDN, LDN</td>
<td><a href="mailto:emilydavismoore@hotmail.com">emilydavismoore@hotmail.com</a></td>
</tr>
<tr>
<td><strong>Newsletter Editor Associate 2016-2017</strong></td>
<td>Jena Savadsky Griffith, BA, BS</td>
<td><a href="mailto:Jenas_mailbox@yahoo.com">Jenas_mailbox@yahoo.com</a></td>
</tr>
<tr>
<td><strong>Newsletter Editor Associate 2016-2017</strong></td>
<td>Racquel Praino, Dietetic Intern</td>
<td><a href="mailto:prainorr01@mail.buffalostate.edu">prainorr01@mail.buffalostate.edu</a></td>
</tr>
<tr>
<td><strong>Newsletter Editor Associate 2016-2017</strong></td>
<td>Dina Ranade, RDN, LD</td>
<td><a href="mailto:dranade@comcast.net">dranade@comcast.net</a></td>
</tr>
<tr>
<td><strong>Newsletter CPE Editor/CPE Item Writer 2016-2017</strong></td>
<td>Shari B Pollack, MPH, RDN</td>
<td><a href="mailto:sbethp@gmail.com">sbethp@gmail.com</a></td>
</tr>
<tr>
<td><strong>Nominating Committee Chair Elect 2016-2017</strong></td>
<td>Stephanie Harris, PhD, MS, RDN, LD</td>
<td><a href="mailto:stephanie-harris@case.edu">stephanie-harris@case.edu</a></td>
</tr>
<tr>
<td><strong>Nominating Committee Member 2016-2017</strong></td>
<td>Elizabeth Redmond, PhD, MS, RD, LD</td>
<td><a href="mailto:eredmond@gdx.net">eredmond@gdx.net</a></td>
</tr>
<tr>
<td><strong>Policy Advocacy Leader 2015-2017</strong></td>
<td>Olivia Wagner, MS, RDN, LDN</td>
<td><a href="mailto:oliviawagner28@gmail.com">oliviawagner28@gmail.com</a></td>
</tr>
<tr>
<td><strong>Professional Advancement Chair 2016-2018</strong></td>
<td>Kory A DeAngelo, MS, RD</td>
<td><a href="mailto:kdeangelo@bastyr.edu">kdeangelo@bastyr.edu</a></td>
</tr>
<tr>
<td><strong>Speakers Bureau Chair 2016-2017</strong></td>
<td>Therese Berry, MS, RDN, LD, CNSC</td>
<td><a href="mailto:therese.austin@coramhc.com">therese.austin@coramhc.com</a></td>
</tr>
<tr>
<td><strong>Social Media Chair 2016-2017</strong></td>
<td>Michelle Loy, MPH, MS, RDN, CSSD</td>
<td><a href="mailto:michelle@gowellnessco.com">michelle@gowellnessco.com</a></td>
</tr>
<tr>
<td><strong>Student Committee Chair 2016-2017</strong></td>
<td>Kathleen Schofield</td>
<td><a href="mailto:schofka@gmail.com">schofka@gmail.com</a></td>
</tr>
<tr>
<td><strong>Volunteer Chair 2015-2017</strong></td>
<td>Ryan Whitcomb, RD, CDN, CLT</td>
<td><a href="mailto:whitcomb.ryan@gmail.com">whitcomb.ryan@gmail.com</a></td>
</tr>
<tr>
<td><strong>Academy Practice Manager 2016-2017</strong></td>
<td>Carrie Kiley, MBA</td>
<td>Manager, DPG/MIG/Affiliate Relations <a href="mailto:ckiley@eatright.org">ckiley@eatright.org</a></td>
</tr>
<tr>
<td><strong>DIFM Office Address</strong></td>
<td>Dietitians in Integrative and Functional Medicine</td>
<td>P.O. Box 308 Mount Pleasant, SC 29464</td>
</tr>
<tr>
<td><strong>Dietitians in Integrative and Functional Medicine</strong></td>
<td>Dietitians in Integrative and Functional Medicine</td>
<td>Website: <a href="http://www.IntegrativeRD.org">www.IntegrativeRD.org</a></td>
</tr>
</tbody>
</table>

---

Dietitians in Integrative and Functional Medicine

a dietetic practice group of the Academy of Nutrition and Dietetics

---

Executive Committee List

Dietitians in Integrative and Functional Medicine

a dietetic practice group of the Academy of Nutrition and Dietetics
Executive Committee Members

Chair 2016-2017
Kelly Morrow, MS, RDN, CD
kmorrow@bastyr.edu

Chair Elect 2016-2017
Mary Purdy, MS, RDN
MaryPurdyRD@gmail.com

Past Chair 2016-2017
Monique Richard, MS, RDN, LDN
mmr2v@mtmail.mtsu.edu

Treasurer 2016-2017
Dana Elia, MS, RDN, LDN
DIFMTreasurer@gmail.com

Secretary 2016-2017
Jessica G. Redmond, MS, RD, CSCS
jess.g.redmond@gmail.com

DPG Delegate 2016-2019
Mary Beth Augustine, RDN, CDN, FAND
delegatedifm@gmail.com

Nominating Committee Chair 2016-2017
Aarti Batavia, MS, RDN, CLT, CFSP, IFMCP
aartibatavia@gmail.com

Thank You to our SPONSORS!

emerson ECOLOGICS

The a2 Milk Company

POM WONDERFUL