Recognition of and Treatment Approaches for Polycystic Ovary Syndrome

by Angela Grassi, MS, RDN, LDN

Poly cystic Ovary Syndrome (PCOS) is a complex endocrine disorder that often goes undiagnosed. Women with PCOS are at risk for infertility and chronic diseases later in life, so early recognition and treatment are key. Dietitians, because of their unique role in developing an ongoing relationship with their patients, may be able to help connect the pieces of the puzzle by recognizing the symptoms patients experience and encouraging further diagnostic testing (see Table 1 for more on the signs and symptoms of PCOS). This article provides an overview of PCOS, including diagnosis and treatment options. Strategies to implement medical nutrition therapy (MNT) and the use of dietary supplements will also be discussed.

What is PCOS?

PCOS is a hormonal imbalance characterized by high levels of androgens (i.e., male hormones such as testosterone) from the ovaries and is associated with insulin resistance. Small cysts called poly cysts usually, but not always, surround the ovaries and appear as a strand of pearls on an ultrasound examination. The cysts result from hormonal imbalances (elevated androgens as well as luteinizing hormone); they don’t cause the hormonal imbalances.

PCOS is also a state of inflammation that is correlated with insulin resistance. Women with PCOS (teens as well as pre- and post-menopausal) have been shown to have higher C-reactive protein (CRP) values, independent of body mass index (BMI).¹

The overproduction of androgens in women causes excessive hair growth on their face and body (hirsutism), alopecia, acne, irregular or absent periods, and infertility. The majority of women with PCOS who are insulin resistant will experience weight gain in the abdominal area, difficulty losing weight, intense cravings for carbohydrates, and hypoglycemic episodes.

Depression and anxiety are common among women with PCOS either from hormonal imbalances or struggles with body image, and attempts at weight loss can lead to distorted eating practices or eating disorders. Irritable bowel syndrome is also more common in women with PCOS.

Now that more is known about the syndrome and the influence of insulin on the increased risk of type 2 diabetes and cardiovascular disease (CVD), PCOS beyond the reproductive years is getting more attention. Panelists from the 2012 NIH Evidence-based Methodology Workshop on PCOS proposed changing the name of PCOS to one that does not just focus on the ovaries but represents the long-term health implications associated with the syndrome.²

Diagnosing PCOS

The current diagnostic criteria for PCOS is the presence of at least two of the following three symptoms: 1) oligomenorrhea (period intervals of > 40 days) or amenorrhea, 2) clinical and/or biochemical signs of...
hyperandrogenism, and 3) polycystic ovaries on an ultrasound, with exclusion of other causes. Insight into the possibility of a client having undiagnosed PCOS can be obtained by asking a few simple questions (Table 2). Table 3 lists the common labs physicians order to help detect and monitor PCOS.

### Table 1. Signs and Symptoms of PCOS

- Excessive abdominal weight (waist > 35 inches)
- Difficulty losing weight despite diet and exercise
- Heavy bleeding or frequent menses
- Irregular (> 40 days) or absent menses
- Intensive carbohydrate cravings
- Hypoglycemic episodes and/or the need to eat frequently
- Excessive hair growth on face, chest, stomach, back or toes
- Hair loss from head (male pattern)
- Acne
- Acanthosis nigricans (dark, dry patches of skin)

### Glucose, Insulin Metabolism, and Type 2 Diabetes Risk

A study published in *Diabetes* showed that the prevalence of type 2 diabetes mellitus (T2DM) in middle-aged, pre-menopausal women with PCOS was 6.8 times higher than that of the general female population of similar age. Women with PCOS who had a greater waist circumference, BMI, or family history of diabetes had a higher prevalence of T2DM.³

Boudreaux and colleagues found that obese women with PCOS had a fivefold increased risk of developing type 2 diabetes compared with age-adjusted controls, indicating that BMI and obesity may be important factors in the development of type 2 diabetes in women with PCOS.⁴

It has been suggested that in women with PCOS there is a rapid progression from impaired glucose tolerance (IGT) to T2DM and that diabetes may occur earlier than expected compared with the general population.³ Because of the elevated risk of developing diabetes, the Androgen Excess and PCOS Society recommends screening for IGT and T2DM with a two-hour oral glucose tolerance test (OGTT) every two years in women with PCOS who have normal glucose levels and annually in those with elevated glucose levels.⁵ Early detection and treatment of IGT with lifestyle changes and insulin-sensitizing medications (e.g., metformin) are crucial to preventing further health complications in the PCOS population.

### Medical Treatment of PCOS

The goal of medical treatment is to determine the underlying cause, manage the problems and reduce the risk of developing diabetes, heart disease and hormone-related cancers. Symptoms of PCOS can be alleviated with lifestyle changes that improve metabolic function, including diet, supplements, exercise and insulin-lowering medications such as metformin. Oral contraceptives may be used to restore and regulate menstrual function and hormone levels as well as decrease acne and hirsutism.⁶ However, use of oral contraceptives has also been shown to increase triglycerides and worsen CRP levels in adolescents with PCOS.⁷ Androgen lowering medications such as spironolactone may also be prescribed but may take many months to effect improvement in hirsutism symptoms.⁶

### Table 2. Questions to ask of patients whom you suspect may have PCOS

- Tell me what your periods are like. Are they heavy, irregular, absent, etc.?
- Do you ever feel lightheadedness, dizziness, or irritability that gets better when you eat?
- Have you ever been told by your physician or healthcare provider that you have any abnormal lab values?
- Do you struggle with excessive facial hair?
- What types of foods do you crave and when do you crave them?
- Do you have dry/rough elbows or any dark patches that look dirty on your body?
- Please describe your weight history (Be observant for resistance to weight loss and positive response to carbohydrate–controlled dietary approaches.)
- Have you (or female family members) experienced infertility, delayed time to conception, and/or recurrent miscarriage?

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**Nutrition Management for PCOS**

Diet and lifestyle changes are the primary treatments for PCOS. Dietitians can provide nutrition counseling and education to women with PCOS to help them make positive changes in their eating habits and subsequently reduce their disease risk and improve their health and fertility.

Weight loss of five to ten percent of total body weight has been shown to improve both reproductive and metabolic parameters associated with PCOS. A range of potential dietary approaches have had favorable effects on weight loss and metabolic parameters in PCOS. One approach involves modifying the glycemic index (GI) and glycemic load (GL) to minimize the rise in insulin and glucose from food.

Marsh and colleagues compared the effects of a low GI diet with a conventional diet (e.g., high fiber and moderate-to-high GI breads and cereals) in 96 women with PCOS without caloric restriction for 12 months. Those who followed the low GI diet had significantly increased menstrual regularity (95% vs. 63% on a conventional diet) and insulin sensitivity. Women with high insulin levels at the start of the study experienced a twofold greater reduction in body fat following the low GI diet compared with those on the conventional diet.

Other nutrition strategies for PCOS involve modifying carbohydrate, fat, and protein intake. A study in the American Journal of Clinical Nutrition showed a high-protein diet (greater than 40% of calories from protein) without caloric restriction resulted in greater weight (7.7 kg vs. 3.3 kg) and body fat loss despite the lack of caloric reduction. In addition, those following a high-protein diet saw greater reductions in waist circumference and decreases in glucose than those following the standard protein diet. The researchers suggested that the high-protein diet group lost more weight because of the satisfying effects of protein on appetite—that is, the women may have felt more satisfied and less hungry when eating a high-protein diet so they consumed less food overall.

Dietary fiber, both soluble and insoluble forms, can aid in weight management by contributing to satiety. Nutrition professionals can educate clients on sources of high fiber foods (fruits, vegetables, whole grains, beans and legumes) and how to include them into their diets.

The plate method is one technique dietitians can use to educate patients about balance and portion control, especially in the early phases of dietary change when they are unfamiliar with what healthy choices may look like. An example of a meal that incorporates healthy fats with lower carbohydrate choices might be six ounces of wild salmon with one cup of sautéed broccoli and two cups of mixed green salad with an olive oil-based dressing.

In addition, due to the increased prevalence of inflammation in women with PCOS, incorporating anti-inflammatory foods such as cold-water fish, dark chocolate, and red wine may be beneficial.

The use of soy in women with PCOS is not clear. One study showed that administration of genistein in women with PCOS not only reduced low-density lipoprotein (LDL) cholesterol but also significantly reduced leutinizing hormone (LH), triglyceride (TG), and testosterone parameters after three months. However, a larger study out this year showed that when the isoflavone intake exceeds approximately 40 mg per day, the overall lifetime risk of never becoming pregnant increased by 13% and that of ever giving birth to a live child was reduced by approximately 3%. Until more research is done on the influence of soy on reproduction and other hormones in PCOS, it may be beneficial to recommend that women with PCOS moderate their intake of soy.

Zinc deficiency is related to higher levels of PCOS hormones in PCOS, it may be beneficial to recommend that women with PCOS moderate their intake of soy.

Dietary Supplements

Additional options for women with PCOS include dietary supplements, which have been shown to improve insulin sensitivity as well as metabolic and reproductive parameters.

**Cinnamon**

Cinnamon is believed to increase the phosphorylation of insulin receptors, which leads to improved insulin function and insulin sensitivity. It may also reduce postprandial insulin response by delaying gastric emptying. A meta-analysis showed that cassia cinnamon (1 to 6 g daily) resulted in significant decreases in HbA1c and fasting plasma glucose in people with T2DM. Fifteen women with PCOS who were randomized to take cinnamon extract for eight weeks showed significant reductions in insulin resistance compared with placebo.

**Magnesium**

Magnesium helps regulate glucose levels by influencing the release and activity of insulin. The Women’s Health Study showed an inverse association between magnesium intake and the risk of T2DM. Sharifi et al found the risk of PCOS for women with magnesium deficiency was 19 times greater than for those who had normal magnesium concentrations. Supplementation with magnesium was shown to improve glucose and
insulin sensitivity in overweight, non-diabetic individuals. Recommended dose is 500 mg-1,000 mg daily.²⁰

**Myo-inositol**

Myo-inositol (MYO) acts as an inositol-phosphoglycan (IPG) mediator, or secondary messenger, relaying signals from insulin receptors on the cell membrane to the cell nucleus.¹⁹ It is believed that women with PCOS have a defect in the insulin-signaling pathway as well as altered metabolism of inositol, which may contribute to insulin resistance.²⁰,²¹ Taking 1.2 to 4 g daily of MYO has been shown to enhance insulin resistance, lipid, and CRP levels in women with PCOS.²²-²⁴ MYO also has been shown to improve ovum quality and reduce the risk of gestational diabetes in women with PCOS.²⁵ Since MYO may lower glucose and insulin levels, it is important to carefully monitor blood sugar levels to prevent hypoglycemia.

**N-Acetylcysteine**

N-Acetylcysteine (NAC) is an antioxidant and amino acid. Specifically, it is a derivative of L-cysteine, an essential precursor used by the body to produce glutathione, an antioxidant that protects against free radical damage and is a critical factor in supporting a healthy immune system. NAC (1.8 to 3 g daily) was shown to decrease body mass index and improve hirsutism, fasting insulin, free testosterone, menstrual irregularity and lipid profile equally as well as metformin in women with PCOS.²⁶ Since NAC may lower insulin levels, it is important to monitor for hypoglycemia.

**Omega-3 fatty acids**

Omega-3 fatty acids offer numerous health benefits to women with PCOS. They can reduce inflammation, lower triglycerides, improve mood, and they may be effective for improving hirsutism and insulin resistance.²⁰ In a study published in the Journal of Obstetrics and Gynecology, overweight women with PCOS were given 1,500 mg of omega-3 fatty acids daily for six months. BMI, insulin, and testosterone levels decreased significantly during treatment.²⁷ Optimal amounts of omega-3 fatty acid supplementation range from 1 to 4 g per day. Women with PCOS should also be encouraged to eat two (3.5-ounce) servings of cold-water fish each week with a high omega-3 but low mercury content, such as wild salmon, sardines, and trout.

Tree nut intake has been shown to positively affect plasma lipids and androgens in women with PCOS.²⁸ In one study, 31 women with PCOS were randomized to receive either walnuts or almonds containing 31 g of total fat per day for six weeks. While no change in weight was observed, both almonds and walnuts reduced LDL cholesterol. Walnuts increased insulin response during an OGTT by 26% and decreased HbA1c from 5.7 ± 0.1% to 5.5 ± 0.1%. Walnuts increased sex hormone-binding globulin, and almonds decreased free androgen levels.²⁹ A recent meta-analysis and systematic review showed an inverse association between eating nuts and diabetes.³⁰

**Vitamin D**

Studies examining vitamin D status in women with PCOS showed an inverse relationship between vitamin D and metabolic risk factors (insulin resistance, BMI, triglycerides, HDL cholesterol).³⁰ A randomized controlled trial failed to show the effect of vitamin D supplementation on insulin sensitivity and insulin resistance in women with PCOS.³¹ Supplementation with vitamin D3 may improve ovulation and conception in women with PCOS.³² The optimal amount of vitamin D for women with PCOS is unknown. The DRI for vitamin D is 600 IU/day, but this may not be sufficient for women with PCOS. The Endocrine Practice Committee has suggested a vitamin D intake of 1,500 to 2000 IU/day to maintain a blood level of 25(OH)D consistently above 30 ng/mL.³³

**Saw Palmetto (Serenoa repens)**

Saw palmetto has proposed antiandrogenic effects. The berries of the saw palmetto palm contain sterols, fatty acids, and flavonoids believed to inhibit the enzyme 5-alpha-reductase that converts testosterone to dihydrotestosterone, a hormone that stimulates hirsutism in women with PCOS.³⁴ To date, no studies have examined the effects of saw palmetto in PCOS. However, an RCT showed saw palmetto was effective in the treatment of androgenic alopecia in men.³⁴ It is unknown whether saw palmetto may help women with PCOS who suffer from androgenic alopecia.

**Fenugreek (Trigonella foenum-graecum)**

Fenugreek (10 to 15 g/day) has been shown to reduce glucose and insulin levels.³⁵ In a double-blind placebo-controlled study of 25 individuals with T2DM, fenugreek improved glycemic control, insulin resistance, and triglycerides.³⁵ Fenugreek seeds contain 50% dietary fiber and pectin, and may affect GI transit, slowing glucose absorption. Fenugreek seeds can be eaten whole, sprouted, or ground into a spice or flour used in baking.

**Spearmint (Mentha spicata)**

Spearmint may be an alternative to antiandrogenic treatment for mild hirsutism. Forty-two volunteers were randomized to take spearmint tea, one cup twice a day for a one-month period and compared with a placebo.³⁶ Free and total testosterone levels were significantly reduced in the spearmint tea group. LH and FSH also increased. Patients’ self-reported degree of hirsutism was

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significantly reduced in the spearmint tea group.³⁶ This is consistent with findings of a previous, five-day study involving women with PCOS and idiopathic hirsutism who drank spearmint tea.³⁷

**Take Home Message**
PCOS is a complex endocrine disorder with reproductive consequences. The nutrition management for women with PCOS should target the underlying inflammation and take into account the risk of long-term complications associated with the disease. This supports the need for treatment involving nutrition and lifestyle modifications for all women with PCOS. Early detection and proactive treatment of PCOS are crucial to prevent the long-term metabolic and reproductive consequences associated with this complex syndrome. Thus, dietitians play an important role in the management of PCOS.

Angela Grassi, MS, RDN, LDN is the author of *PCOS: The Dietitian’s Guide, The PCOS Workbook: Your Guide to Complete Physical and Emotional Health, The PCOS Nutrition Center Cookbook: 100 Easy and Delicious Whole Foods Recipes to Beat PCOS* and is the co-author of the section on PCOS in The Academy of Nutrition and Dietetics Nutrition Care Manual. Angela is the founder of The PCOS Nutrition Center, where she provides evidence-based nutrition information and counseling to women with PCOS. Having PCOS herself, Angela has been dedicated to advocacy, education, and research of the syndrome. Contact Angela at agrassi@pcosnutrition.com.

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Table 3. Labs used to diagnose and monitor PCOS

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References


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CPE Reporting Form
Recognition of and Treatment Approaches for Polycystic Ovary Syndrome
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Questions:

Recognition of and Treatment Approaches for Polycystic Ovary Syndrome

1) Which of the following supplements was shown to improve hirsutism, fasting insulin, testosterone, and menstrual irregularity as well as metformin?
   A. Chasteberry
   B. Magnesium
   C. N-Acetylcysteine
   D. Omega-3 fatty acids

2) All of the following dietary supplements have been shown to improve insulin sensitivity except:
   A. Saw palmetto
   B. Cinnamon
   C. Myo-inositol
   D. Magnesium

3) Which of the following dietary approaches was found to improve menstrual regularity in women with PCOS?
   A. 40 grams of soy daily
   B. Two servings per week of cold-water fish
   C. A low GI diet
   D. A high protein diet

4) Which of the following lab values would most likely be increased in women with PCOS?
   A. Thyroid hormone
   B. Estrogen
   C. Testosterone
   D. HDL cholesterol

5) The excessive growth of facial and body hair, alopecia, acne, and menstrual irregularity common in PCOS are caused by which of the following:
   A. Insulin resistance
   B. Overproduction of androgens
   C. Magnesium deficiency
   D. Poly cysts on the ovaries
Recognition of and Treatment Approaches for Polysystic Ovary Syndrome

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Aglaée Jacob Interview

Aglaée Jacob is author of "Digestive Health with REAL Food: a practical guide to an anti-inflammatory, low-irritant, nutrient-dense diet for IBS & other digestive issues" as well as a companion cookbook by the same name. She regularly contributes to The Paleo Mag and Today's Dietitian. She is in private practice in Canada and studying naturopathic medicine at the Canadian College of Naturopathic Medicine in Toronto. The following interview was conducted by Dina Ranade, RDN, as a preview to the Digestive Health Module currently in development as part of the Academy-accredited online Integrative and Functional Nutrition Certificate of Training Program. The training program is a 10-hour CPE program that includes five 2-hour CPE modules, and the topics are Introduction to Integrative and Functional Nutrition, Digestive Health, Detoxification, Inflammation, and Dietary Supplements. Our first module author, Kathie Madonna Swift was highlighted in the Summer issue of the Integrative RDN.

AJ: After working as a dietitian/diabetes educator for a couple of years, I realized that most of the guidelines I was using weren't very effective for the majority of my patients. At some point, I lost faith in my belief that nutrition and food could be powerful tools to optimize health and wasn't sure what I wanted to do anymore. I took a drastic measure and sold everything I owned and went backpacking in South America for a few months. I traveled, saw new places, tasted different foods, discovered new cultures and even volunteered as a dietitian for a couple of months in Puerto Ayora, Galapagos, Ecuador. During long bus rides across the Andes, I listened to many podcasts and read many scientific studies that I would have previously dismissed just by reading the title a few months earlier. I guess traveling really opened my mind to everything and I was ready to learn about the "other side" of nutrition, the one I didn't know existed and the one that was kept hidden from me during my training and work as a traditional dietitian. But this was only the beginning. In the following months, I started experiencing severe digestive issues and was diagnosed with a parasite infection. I was treated for it but the symptoms persisted (post-infectious irritable bowel syndrome (IBS), which is a not uncommon way of developing IBS). I tried changing my diet (I was already eating grain-free, dairy-free and sugar-free at that time) with very little success, until I was down to four foods. This whole process made me learn a lot about "alternative" healing methods and changed my whole perspective on nutrition. Through trial and error, I managed to bring myself back to health, expanding my own elimination diet protocol at the same time. I actually feel better and healthier than I ever did in my 20s. I changed the way I practice as a dietitian and have been having a lot more success helping my patients. I believe in the power of food again.

DR: What experiences or beliefs have led you in the direction of integrative and functional nutrition?
AJ: After working as a dietitian/diabetes educator for a couple of years, I realized that most of the guidelines I was using weren't very effective for the majority of my patients. At some point, I lost faith in my belief that nutrition and food could be powerful tools to optimize health and wasn't sure what I wanted to do anymore. I took a drastic measure and sold everything I owned and went backpacking in South America for a few months. I traveled, saw new places, tasted different foods, discovered new cultures and even volunteered as a dietitian for a couple of months in Puerto Ayora, Galapagos, Ecuador. During long bus rides across the Andes, I listened to many podcasts and read many scientific studies that I would have previously dismissed just by reading the title a few months earlier. I guess traveling really opened my mind to everything and I was ready to learn about the “other side” of nutrition, the one I didn't know existed and the one that was kept hidden from me during my training and work as a traditional dietitian. But this was only the beginning. In the following months, I started experiencing severe digestive issues and was diagnosed with a parasite infection. I was treated for it but the symptoms persisted (post-infectious irritable bowel syndrome (IBS), which is a not uncommon way of developing IBS). I tried changing my diet (I was already eating grain-free, dairy-free and sugar-free at that time) with very little success, until I was down to four foods. This whole process made me learn a lot about “alternative” healing methods and changed my whole perspective on nutrition. Through trial and error, I managed to bring myself back to health, expanding my own elimination diet protocol at the same time. I actually feel better and healthier than I ever did in my 20s. I changed the way I practice as a dietitian and have been having a lot more success helping my patients. I believe in the power of food again.

DR: What training/education have you obtained?
AJ: I have a B.Sc. and M.Sc., both in Nutrition, from Laval University in Québec City, QC, Canada (where the requirements to become an RD are the same as in the USA) that allowed me to become a traditional RD. But I would say that most of my education has been through my own research, spending countless hours over the last 3-4 years discovering alternative ways to practice nutrition and focusing most of my energy on healing myself. I am also now halfway through completing a very intensive 4-year degree in naturopathic medicine in the hope to combine the power of REAL food with additional tools like herbal medicine, acupuncture and homeopathy.

DR: How would you like to see the area of integrative and functional nutrition advance?
AJ: This is a good question. I guess that the ultimate goal would be to integrate it into the education programs of dietitians-to-be. I think that RDs can play such a huge role in health promotion as well as in disease prevention and treatment, but I think that we need to be exposed to different philosophies and theories to be more effective with our approach.

DR: Can you briefly describe the content of the Digestive Health Training Module?
AJ: The module I'm working on will include a lot of information about what healthy digestion should be like, the role of the gut flora, and the different problems that can affect the digestive system such as IBS, infections, small intestinal bacterial overgrowth (SIBO), FODMAP intolerance, non-celiac gluten sensitivity, to name a few. It also looks at very practical ways to assess digestion and to implement a well-designed elimination diet to help patients identify their food sensitivities more easily. I'll also present a few case-studies to illustrate this approach.

DR: What makes this topic a foundational piece of integrative and functional nutrition and what is the take home message of the module?
AJ: Health starts in the gut! Not very original, but very true. Without a
healthy digestive tract, we can’t absorb nutrients properly to allow our body to function optimally and heal. We need a healthy gut flora to assist our immune system. We need an intact intestinal barrier to protect us from harmful compounds and decrease our risk of developing autoimmune conditions. Dietitians are the perfect health care provider to ask the right questions to assess digestive health and assist their patients in bringing it to its optimal level.

**DR:** What do you think is poorly understood or not yet understood about digestive health?

**AJ:** That it’s not normal to feel bloated, have abdominal discomfort or have bowel movements only twice a week (or 6-10 times a day)! And although most people would tend to make jokes about these things, these signs need to be taken seriously because they are symptoms of an imbalance in the digestive system that, if left untreated, might result in serious consequences in the long-term including, increased risk of infection, decreased immunity, nutritional deficiencies, a variety of systemic symptoms and even autoimmune conditions. The digestive tract is not a simple tube through which food passes. It’s a very highly complex environment, of which we still don’t know much, that deserves more of our attention.

**DR:** As a brief preview into the module you are writing, what is one of your favorite healing methods to increase gut bacteria for better digestion?

**AJ:** Increasing gut bacteria isn’t the answer for everyone. In the case of small intestinal bacterial overgrowth (SIBO), there is an excess of bacteria that can cause a lot of harmful effects even though they are non-pathogenic. I think that what is the most important is to balance the gut flora. I believe that implementing an elimination diet protocol is the first way to accomplish this in order to identify trigger foods that might be contributing to damaging the gut lining and feeding the wrong bacteria within the digestive tract.

**DR:** What example can you offer of successful digestive healing and how it improved the health of a patient?

**AJ:** In the module, I’ll present a few case studies but one of the most impressive is that of a patient with Crohn’s and psoriasis, both autoimmune conditions. As I worked with her, not only was she able to control all of her digestive issues while decreasing the amount of medications she was taking, but she was also able to get almost all of her plaques to fully disappear within six months. This makes a lot of sense considering the theory that autoimmunity might be associated with increased intestinal permeability. This is just an example of the many, sometimes unexpected effects, healing the gut can have.

**DR:** What other resources would you recommend that our readers review to advance learning about digestive health?

**AJ:** Can I recommend my book? Digestive Health with REAL Food and its companion cookbook of the same name are a collection of everything I learned about digestive health to heal myself and my patients. Although I wrote it in a way to make it easy to understand for everyone, I think that health professionals like RDs can get a lot more out of it and can help improve the life of many more people by using the proposed protocol (or an adaptation of it).

I would also recommend A New IBS Solution by Dr. Mark Pimentel, The Paleo Approach by Dr. Sarah Ballantyne, Fast Tract Digestion by Dr. Norman Robillard, and Deep Nutrition by Dr. Catherine Shanahan.

**DR:** What are some clinical pearls that would be useful to members to use for their functional nutrition practice?

**AJ:** As much as we would like to believe that educating our patients is enough, it is usually not sufficient to induce change. Of course, I do believe that education is important and many patients want to better understand the whys before moving into action, but I learned that it’s actually more important to ask the right questions, listen carefully and work with the patient to build a plan that is realistic, sustainable and patient-centered. It’s also important to go beyond the food choices of our patients and also investigate their eating environment, relationship with food, cooking abilities, supplements, medications, sleep, stress, support network and all other factors that could be part of their individual picture. In my experience, a holistic, individualized and collaborative approach with the patients yields powerful results.

**DR:** What advice would you give to those who are just entering the field of integrative and functional nutrition?

**AJ:** It can be quite overwhelming at first when you realize there is still so much you don’t know, but don’t give up. Take it one day at time and whenever you get a chance, pick a topic you’re interested in, research it well and reflect on how you could integrate that information to your practice. With time, your practice will grow in a more holistic direction and you’ll be able to help your patients reach their health goals.
Introduction

It is no surprise that there is a direct interaction between diet and health. Recent research has narrowed this interaction and has examined the interplay between diet and an individual’s intestinal bacteria (intestinal microbiome). This has led to many new media stories and marketing campaigns touting the importance of prebiotics and probiotics on the microbiome. However, the International Food Information Council (IFIC) 2014 Food and Health Survey reported that only half of Americans fully understand and believe the health benefits of certain types of foods. More specifically, the 2013 IFIC Functional Foods Consumer Survey found that close to two-fifths of Americans are unsure of their daily consumption of probiotics and their impact on health. These data suggest that while American consumers have heard about probiotics, many are unsure of the sources and impact on human health. This article will discuss the microbiome, probiotics and prebiotics, and will also detail strategies to increase probiotics and prebiotics consumption.

The microbiome: 100 trillion cells strong

The human body, ranging from the armpit to the belly button to the oral cavity, houses microbial communities that are extremely diverse and unique to each individual. Microbes are microorganisms that lack a nucleus and include all bacteria, archaea, nearly all protozoa, and some fungi and algae. The largest majority of these microbes reside in the gastrointestinal tract and have been called such terms as the microbiome, the microbota, or the microflora. Since the microbes do not contain nuclei like human cells, the microbes are easily distinguished from human cells based on cellular replication machinery. Research has shown that the relationship between the microbiome and humans is not solely a non-harmful relationship, but rather a mutualistic partnership where each organism benefits from each other. Moreover, research has shown that the microbiome contributes to human health by aiding in digestion, providing energy and nutrients, outcompeting harmful bacteria, and training the immune system. The healthy microbiome is largely dominated by three bacteria phylas: Bacteroidetes, Actinobacteria, and Firmicutes. Altered microbiome profiles have been associated with obesity, inflammatory bowel conditions, cancer, and cardiovascular disease.

Probiotics: microbiome-promoting bacteria

As mentioned above, the microbiome is comprised of trillions of bacteria which help to promote human health. Products containing microbiome-promoting bacteria are thought to have probiotic benefits. The majority of bacteria that are found in commercial probiotic foods and probiotic supplements include Bifidobacterium, Streptococcus, and Lactobacillus. However, not all bacteria present in fermented milk products or yogurt have a probiotic effect. For this reason, in order to be classified as a probiotic, the specific strains must exhibit clinical health benefits and/or contain more than 108 organisms/gram at the end of manufacturing. Some of the health benefits associated with probiotic intake include reducing markers of inflammation and allergy, constipation, lactose intolerance, colonization of potential pathogenic bacteria, inflammatory bowel conditions, and cancer. In addition, probiotics can be used to reduce incidence of antibiotic-associated diarrhea and can help to recolonize the gastrointestinal tract after antibiotic treatment.

Prebiotics: food for the microbiome

Prebiotics were first defined in 1995 as “a nondigestible food ingredient that beneficially affects the host by selectively stimulating the growth of one or a limited number of bacterial species in the colon, and thus improves health.” Since then, the concept of prebiotics has garnered much attention and generated scientific research interest. Over time, the definition of prebiotics shifted to match scientific findings. The definition was narrowed down to three criteria: 1) prebiotics must be resistant to gastric acidity, hydrolysis by enzymes, and gastrointestinal absorption; 2) prebiotics must

Probiotics: sources and bioavailability

Naturally fermented foods contain the highest amounts of live active cultures. These foods include yogurt, buttermilk, kefir, kombucha, kimchi, sauerkraut, miso, microalgae, and tempeh. While all these foods contain live cultures, to be classified as a “probiotic”, the live cultures must have documented health benefits. This is an important distinction since many products are labelled as containing live active cultures, which may cause confusion for consumers. Studies have shown that the probiotics are able to survive transit through the intestinal tract, suggesting that ingestion of probiotic foods is highly efficacious. However, there remains confusion regarding the dose and duration of probiotics in the body which can be attributed to the lack of a standardized dose, the different probiotic sources, and the unique nature of an individual’s microbiome. For those who prefer not to consume probiotics in the form of food, probiotic supplements are a potential option to receive some of the health benefits. However, consuming probiotics from food sources have an added benefit since these foods may also contain fiber, micronutrients, and macronutrients.
Prebiotics: sources and bioavailability

Prebiotics are composed of carbohydrate oligo- or polymers that cannot be digested by the host. Since these carbohydrates cannot be digested due to lack of specific enzymes, the gut microbiome instead ferments the carbohydrates for energy and nutrients. Inulin, polydextrose, fructooligosaccharides (FOS) and galactooligosaccharides (GOS) are examples of prebiotics. Inulin, FOS, and GOS are naturally occurring carbohydrates found in foods such as bananas, honey, leeks, onions, and garlic. In addition, many fortified foods and beverages contain prebiotics to aid in digestion. Studies have shown that the recommended dose ranges from 2-30 grams/day of prebiotics and their effects are dependent on the structure and matrix of the prebiotic.³¹ Of note, the health benefits of prebiotics may take several weeks which may be important information for consumers to understand. Studies have shown that prebiotics enhance the immune system, boost short chain fatty acid production, and exert anti-inflammatory effects.³²,³³ Specifically, FOS has been shown to increase bifidobacteria and reduce inflammation.³⁴ Inulin and GOS have been shown to improve immune responses.³⁵,³⁶ Health professionals may suggest consuming prebiotics with probiotics, such as combining yogurt with bananas, to enhance the growth and activity of beneficial members in the microbiome.

Implications for Registered Dietitian Nutritionists

The 2013 IFIC Functional Foods survey proves that the majority of Americans remain interested in learning more about foods that promote health. Registered dietitians are well positioned to provide education on health promoting foods such as probiotics and prebiotics. Currently, there is no government-issued daily recommended intake for these functional components, though the International Scientific Association for Probiotics and Prebiotics (ISAPP) recommends consumption of 109 CFU of probiotics a day, which can be achieved through consuming approximately one cup of yogurt. Moreover, the 2010 Dietary Guidelines for Americans recommend increasing intake of fat-free or low-fat milk and milk products, such as milk, yogurt, cheese, or fortified soy beverages which may contain these beneficial components. Registered dietitian nutritionists can also communicate on the variety of foods that contain probiotics and prebiotics and provide tips on how these foods can be incorporated into meals and snacks (Table 1). While there is a multitude of science to “digest” on the microbiome, probiotics, and prebiotics, the take home message for registered dietitian nutritionists is simple; probiotics and prebiotics play essential roles in promoting a healthy microbiome and can help to improve overall health.

Table 1. Meal Suggestions to Incorporate Probiotics and Prebiotics into Diet

<table>
<thead>
<tr>
<th>Snack</th>
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<tbody>
<tr>
<td>Breakfast</td>
<td></td>
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<tr>
<td>• Yogurt live cultures</td>
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<tr>
<td>• Pancakes topped with flavored yogurt and fresh fruit</td>
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<tr>
<td>• Oatmeal with honey</td>
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<tr>
<td>Lunch</td>
<td></td>
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<tr>
<td>• Peanut butter and honey sandwich</td>
<td></td>
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<tr>
<td>• Spinach, leek, and artichoke dip with pita bread</td>
<td></td>
</tr>
<tr>
<td>Dinner</td>
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<tr>
<td>• Garlic tomato sauce with fortified whole wheat penne pasta</td>
<td></td>
</tr>
<tr>
<td>• Hamburger on a whole grain bun with sauerkraut slaw</td>
<td></td>
</tr>
<tr>
<td>• Kabobs with onions, pineapple, peppers and steak</td>
<td></td>
</tr>
<tr>
<td>Snack</td>
<td></td>
</tr>
<tr>
<td>• Banana with drizzled honey</td>
<td></td>
</tr>
<tr>
<td>• Smoothie with yogurt, orange juice, honey and banana</td>
<td></td>
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</tbody>
</table>

Megan Meyer is a PhD Candidate at The University of North Carolina at Chapel Hill in the Department of Microbiology and Immunology and an intern at International Food Information Council (IFIC) Foundation. Megan received a B.S. in Biology from Loyola University in Maryland and is passionate about science communication and science outreach. Contact Megan at mgmeyer@email.unc.edu.

Sarah Romotsky is the Associate Director of Health & Wellness at the International Food Information Council (IFIC) Foundation in Washington DC. Sarah received a BA in Mass Communications from University of California, Berkeley and later completed the Dietetic Program at San Francisco State University. She completed her Dietetic Internship at George Washington University Hospital in Washington, DC. Contact Sarah at romotsky@ific.org.

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Complete references for this CPE article may be found in the full electronic version of the newsletter at http://www.integrativerd.org under Archived Newsletters.
References

Mind, Food, Mood Review

The increasing prevalence of depression, anxiety, cognitive decline, autism, schizophrenia, attention deficit disorder, and other neuropsychiatric diagnoses represents a serious challenge to the health care system. Symptom-based, modern medicine views brain health somewhat separately from the rest of the body, with regard to disease etiology, diagnosis, and treatment. The Center for Mind Body Medicine presented a workshop March 14-16, 2014 at Kripalu Center for Yoga & Health in Stockbridge, MA, entitled Mind, Mood and Food: Optimal Nutrition for the Brain. The program fostered a reawakening of the traditional understanding that the mind and body are one. An understanding of dietary-lifestyle approaches to the prevention, management, and treatment of neurological conditions is highly relevant for today's nutrition and dietetic professionals. The workshop's cutting-edge information was enormously worthwhile and presented by James S. Gordon, MD, Psychiatrist and Director of the Center for Mind Body Medicine; Jay Lombard, DO, Neurologist; Mark Pettus, MD, Internist and Nephrologist; Drew Ramsey, MD, Psychiatrist; and Kathie Swift, MS, RDN, LDN, Clinical Dietitian and Food As Medicine Education Director.

Dr. Jay Lombard, author of Balance Your Brain, reported that 26.2% of Americans (57.7 million) over age 18 suffer from a diagnosable mental disorder in any given year. The causes are highly complex; each individual's unique inheritance is interwoven with various environmental factors. In countless ways, the heart and the brain are linked on a molecular basis—an awe-inspiring medical confirmation of the oneness between mind and body. This theme was repeated throughout the conference.

Dr. Lombard described basic brain physiology and introduced neurotransmitters, the major nerve chemicals (Table 1). Given that the brain is composed of 65% lipid, the appropriate amounts of omega-3 and -6 fatty acids are paramount for proper information transmission. Furthermore, the synthesis, transport, and responsiveness of the neurotransmitters depend upon nutrient adequacy. Dopamine, for example, which plays a key role in influencing attention, appetite, depression, and addiction, requires iron and folate for its synthesis and zinc for optimal action.

Mark Pettus, MD, author of It's All in Your Head: Change Your Mind, Change Your Health, Change Your Life, discussed core imbalances in the body and their impact on mind and mood. From a holistic perspective, wellness can be viewed as a robust tree, nourished by fundamental practices at the root (origin)—the interaction among genes, diet, and environmental factors. The growing stem and resulting leaves are the more visible signs. The main (core) areas responsible for supporting overall wellbeing—the stem enabling healthy leaves to grow—can become unbalanced by improper care at the root level, leading to: 1) inflammation; 2) insulin resistance; 3) intestinal barrier function; and, 4) the stress response. The resulting leaves—how things appear—are the actual diagnosable diseases, such as prediabetes, cognitive decline, and cancer (Figure 1). Health care providers need to pay attention to the conditions of the soil rather than focusing mainly on the quality of the leaves. Dr. Pettus related various dietary and lifestyle factors to these core areas. High glycemic carbohydrate-based diets can lead to the development of insulin resistance and—along with high n6:n3 fatty acid ratios and chronic stress—contribute to an inflammatory state of the body/brain. Low intakes of fruits, vegetables, and fiber can lead to problems with gut barrier function through changes in the bacterial milieu. Vitamin D insufficiency and environmental toxins—GMOs, mercury in fish, pesticide residues, bisphenol A in plastics—are also major factors in reducing optimal brain function. Sensitivities to gluten and dairy can contribute to serious core imbalances. In addition, nutrients and lifestyle practices can increase or decrease the expression of our DNA. The synthesis of Brain Derived Neurotropic Factor (BDNF)—which can enhance neural connections in the brain throughout life—can be increased by exercise, meditation, and nutritional factors such as caloric restriction, docosahexaenoic acid [DHA], curcumin, and epigallocatechingallate (EGCG). In summary Dr. Pettus stated, “food is information that speaks to us at the level of our genes.”

Drew Ramsey, MD, author of Fifty Shades of Kale, described how, in his own practice, he assesses each patient's diet history with 1-week food logs and suggests simple alternatives to boost brain health. He recommends that individuals include seafood such as mussels, clams, and oysters being high on this list, along with small fish low in mercury, such as anchovies and sardines, greens, and colorful, unprocessed foods, with emphasis on the Mediterranean-diet approach. Recent data show that such traditional diets may reduce the risk of depression.1 Highly regarded brain food categories were each given attention and rationale: fish, leafy greens, fats, legumes, nuts, seeds, whole grains, herbs and spices, grass-fed and finished meat, pasture raised eggs, fermented foods, and beverages: green tea, coffee, milk, and (in small quantities) fruit juice. Top brain food nutrients highlighted were: omega-3 fatty acids, folate, fiber, vitamins B1, B12, and D, magnesium, calcium, vitamin E, choline, iron, and zinc along with numerous phytochemicals. Exciting new research indicates that factors in the diet (particularly omega-3 fatty acids) can increase the development of new neurons, a process which has been shown to occur even in the adult hippocampus, an area of the brain important for learning and memory.2

On the topic of supplements,
Dr. Ramsey advised that there is considerable debate and opinion and the Natural Medicines Comprehensive Database can be a useful resource for clinicians. He provided a helpful chart with dosages, ratings, and any precautions or contraindications regarding their use. He recommended that practitioners partner with specialists in the fields of meditation, yoga, herbal medicine, and acupuncture.

Kathie Swift, MS, RDN, LDN, co-author of Inside Tract: Your Good Gut Guide to Health, discussed the important connection between digestive function and brain health. She provided a detailed explanation of the working of the gut, and the tight junctions that can become weakened through a variety of physiological and/or psychological factors, many of which are under our control. She elucidated the all-important roles of the microbiome—the intestinal microflora—in maintaining immunity, fighting infections, producing biotin and vitamin K, protecting the integrity of the intestinal barrier, managing inflammation, and assisting with nutrient absorption. The interesting interaction between the autonomic nervous system, the nervous system in the gut (enteric NS), and the gut’s immune system (the largest immune organ of the body) helps to explain the relationship between infection and psychiatric illness, such as in syphilis and Lyme disease. Relationships among the gut bacteria and nutrient precursors for neurotransmitters have widespread impact on the mind and mood. ³ Factors that affect gut health and the microbiome include antibiotics, chemicals, low-fiber intake, stress, micronutrient deficiencies, food sensitivities (especially gluten), increased glycemic load, and less-than-optimal fatty acid intakes.

Kathie provided a roadmap for rebuilding a healthy gastrointestinal tract, which she calls the “5R Program,” including removing offenders (‘gut irritants’), replacing digestive factors, repopulating (pre- and probiotics), repairing (gut healing nutrients), and rebalancing (with lifestyle practices that reduce stress, improve circulation, and add fresh air, nature, and mindfulness). She gave examples of healthy, nutritious meals which were gluten free and others that were low in the more simple, often poorly absorbed (and thus highly fermentable) carbohydrates: Fermentable, Oligo-, Di- [lactose], and Monosaccharides [fructose], And Polyols, known as FODMAPS.

James S. Gordon, MD, who moderated the program, conducted Q&A sessions and also provided experiential interludes throughout the seminar. The first activity was called ‘soft-belly meditation’—a calm and unhurried, deep breathing method, followed by a discussion of how this exercise affected us. In another activity, we all had a chance to use crayons and paper to draw our “relationship to food” and then share our results with a partner. The drawing provided an unconscious window into the current, unique role of food in one’s life, i.e., the special meanings/emotions/habits attached to food. In another exercise, with eyes closed we let loose to get unstuck and shake things up with whole-body shaking to rapid-pulse instrumental music for several minutes, followed by free-flowing and non-judgmental dancing. This roused the group to new levels of energy! The final experience focused on mindfully eating a food sample, while noticing the food’s various qualities in new and attentive ways. Dr. Gordon shared ideas and advice on using these exercises with our own clients to optimize their benefits.

Saturday evening featured an inspiring cooking class with Jeremy Smith, Executive Chef of Kripalu, who provided a light-hearted, entertaining, and interesting demonstration of Indian chickpeas in coconut curry sauce, kale with roasted cherry tomatoes, and quinoa avocado salad. Daily meals at Kripalu included a wide selection of whole foods that could meet the needs of any food preference: Buddha’s bar for vegans, tasty bean and whole grain dishes, fresh-baked goods, gluten-free items, and egg, fish, and meat offerings. Morning meals were eaten in total silence to enhance the sense of mindfulness. Yoga sessions were available for participants during non-class times.

All in all, this was one of the most enriching weekends I have ever experienced! I’m inspired to share this information with others, as well as to expand my time spent in outdoor activity, practice daily meditation and yoga, optimize my food selections, and…relax.

Member Benefit: The Center for Mind Body Medicine and DIFM DPG have a networking relationship including discounts for their educational programs. Mark your calendar for Mind, Mood and Food 2015, March 13-15th, at Kripalu, the nation’s largest yoga center!

Reviewed by Janet M. Lacey, DrPH, RD, LDN, Professor, Department of Nutrition, West Chester University of PA in fulfilling the Professional Stipend Award requisites. Contact Janet at: jlacey@wcupa.edu.

Figure 1: Overview of neurotransmitters and their functions

<table>
<thead>
<tr>
<th>Neurotransmitter</th>
<th>Major role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylcholine</td>
<td>“Hard drive” of the brain—important for memory retention and storage</td>
</tr>
<tr>
<td>Dopamine</td>
<td>Reward system, sense of euphoria—“hedonistic neurotransmitter”</td>
</tr>
<tr>
<td>Gamma amino butyric acid (GABA)</td>
<td>Inhibition/relaxation</td>
</tr>
<tr>
<td>Glutamate (GLU)</td>
<td>Electrical excitation (a GLU imbalance can lead to anxiety and insomnia)</td>
</tr>
<tr>
<td>Norepinephrine</td>
<td>Fight or flight response</td>
</tr>
<tr>
<td>Serotonin</td>
<td>Homeostasis, regulation of dopamine and GLU</td>
</tr>
</tbody>
</table>

Continued on pg. 34
Figure 2: Root causes and the core imbalances that determine disease appearance

Disease (how things appear)
- Pre-diabetes
- Diabetes
- Obesity
- Metabolic Syndrome
- Heart Disease
- Stroke
- Depression
- Autoimmunity
- ADHD, autism
- Cognitive decline
- Alzheimer’s
- GAD
- Cancer

Core Metabolic Imbalances (what drives them)
- Inflammation
- Oxidative Stress
- Mitochondrial
- Fight-Flight (HPA axis)
- Microbiome (Gut-Immune)
- Insulin resistance
- Detoxification

Root Causes (what are their origins)
- Gene
- Epigenome
- Environment
- Nutrition
- Movement
- Stress Response
- Environmental toxins
- Sleep
- Social Connection
- Trauma
- Conflict Management
- Stress Management
- Meaning in Work, Love, Play

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REFERENCES


Compiled by Jacqueline Santora Zimmerman, MS, RDN, DIFM Associate Editor. Jacq.zimmerman@gmail.com

Upcoming Conferences and Meetings

October 18-21, Food and Nutrition Conference and ExpoTM (FNCE®). Atlanta, GA.
- This year the Academy has added a new track: Emerging Integrative Approaches for Nutrition and Dietetics Practice. To see sessions included, go to: http://fnce.eatright.org/fnce/Tracks.aspx?GroupID=208.

- Stop by the DIFM Booth at Product Marketplace and the DPG Showcase:
  - Product Marketplace, Booth 34, Level 3 Foyer – Sunday, October 19, 8:00 am – 4:00 pm
  - DPG Showcase, Booth 31, Level 3 Foyer – Monday, October 20, 10:30 am – 1:00 pm

Here you can learn about exciting opportunities and updates within DIFM and meet and network with members of the executive committee and other DIFM members. As a special thank you for your valued membership, receive an education-filled flash drive, including the previous 2012 workshop, webinars, and other materials designed to help you grow as a DIFM dietitian.

- DIFM’s Mind Body Happy Hour featuring three 15-minute, back-to-back sessions of yoga, Qi Gong, and meditation. Monday, October 20, 5:30 – 7:30 pm, Omni at CNN Center - Maple Room. For more details and registration: http://integrativerd.org/members-only/fnce-2014/.

October 19-22, American College of Lifestyle Medicine Annual Conference. San Diego, CA.
http://lifestylemedicine2014.org/


November 14-16, 1st Annual National Plant-based Prevention Of Disease (P-POD) Conference, Asheville, NC. Being submitted for 16 RD CPEU’s, registration $13/CPEU. 19 speakers (9 MDs, 7 RDs) about major chronic diseases. Contact: info@P-POD.org, info@PreventionOfDisease.org. For the flyer & registration form, go to: https://drive.google.com/file/d/0B-1UR51w4YwwdnhuYURqLWY3OU0/edit?usp=sharing.

What’s New - Journal Reviews and Resources

PCOS, Folate and Metabolic Profile
In an eight week double-blind trial, obese women diagnosed with polycystic ovary syndrome (PCOS) (n=81) between the ages of 18-40 years old were randomized to receive 5 mg/day of folate, 1 mg/day of folate or placebo. Compared to the 1 mg/day and placebo groups (in which no significant effects were seen), women taking 5 mg/day of folate had significantly reduced plasma homocysteine, improved total cholesterol/HDL-C ratio and improved homeostasis model of assessment-insulin resistance scores. Mean changes of serum total cholesterol, LDL-, and non-HDL-cholesterol levels were also significant in the 5 mg/day group only. The authors conclude, “5 mg/day folate supplementation for 8 weeks among women with PCOS had beneficial effects on metabolic profiles.” Asemi Z, Karamali M, Esmailzadeh A. Metabolic response to folate supplementation in overweight women with polycystic ovary syndrome: A randomized double-blind placebo-controlled clinical trial. Mol Nutr Food Res. 2014;58(7):1465-73. PMID: 24828019

Lupus, Epigenetics and the Microbiome
The May 2014 issue of Lupus was dedicated to exploring environmental causes of systemic lupus erythematosus (SLE). An editorial therein highlights the relationships among environmental factors, the human microbiome and the epigenetic changes it produces, and development of lupus or other autoimmune diseases. Several featured articles report on the relationship of diet, microbiota, alcohol consumption, smoking, pesticides, chemical and industrial exposures and SLE. Edwards CJ, Costenbader KH. Epigenetics and the microbiome: developing areas in the understanding of the aetiology of lupus. Lupus. 2014;23(6):505-6. PMID: 24763534. Free access to the editorial: http://lup.sagepub.com/content/23/6/505. Table of Contents for the issue: http://lup.sagepub.com/content/23/6.toc
Probiotics during Childhood Reduce Eczema Risk
A systematic review and meta-analysis of randomized controlled trials concluded that, “The use of probiotic supplements during pregnancy and/or during infancy creates a statistically significant decline in the incidence of eczema.” Sixteen studies examining ten probiotics with participants of seven years old or younger (n=2797) were included in the analysis. The pooled relative risk of all studies (0.74, 95% confidence interval 0.67, 0.82), indicated development of eczema was significantly affected by probiotic supplementation during childhood. Mansfield JA, Bergin SW, et al. Comparative probiotic strain efficacy in the prevention of eczema in infants and children: a systematic review and meta-analysis. *Mil Med.* 2014;179(6):580-92. PMID: 24902123

Oxidative Stress a Predictor for Hip Fracture
In a prospective study of postmenopausal women (n=996) participating in the Nurses’ Health Study, researchers examined the association of oxidative stress and hip fracture. Baseline blood samples were collected 1998-1990 and maximum follow up was 23 years, during which 44 hip fractures (4.4%) were reported. Oxidative stress was assessed by measuring plasma fluorescent oxidation products (FIOPs) at three excitation/emission wavelengths: 360/420 nm (FIOP_360); 320/420 nm (FIOP_320) and 400/475 nm (FIOP_400). Researchers note that, “FIOPs are generated from many different pathways (lipid, protein and DNA) and reflect a global oxidation burden.” Adjusting for other hip fracture risk factors including history of osteoporosis, hypertension, prior fracture and smoking status, women with increased baseline plasma FIOP_320 was significantly associated with risk of hip fracture, and the risk increased in a linear fashion. FIOP_320 is produced in the presence of metals when lipid hydroperoxides, aldehydes and ketones react with DNA. No association with hip fracture was found for FIOP_360 or FIOP_400. Yang S, Feskanich D, Willett WC, Eliassen AH, Wu T. Association between Global Biomarkers of Oxidative Stress and Hip Fracture in Postmenopausal Women: A Prospective Study. *J Bone Miner Res.* 2014 Jun 23. doi: 10.1002/jbmr.2302. [Epub ahead of print] PMID: 24957524

Probiotics for Hypertension
Nine studies with 543 participants were included in a systematic review and meta-analysis of randomized controlled trials examining probiotic supplementation and blood pressure (BP). Participants were adults with normal and elevated BP. Analysis revealed that compared to placebo, probiotics significantly lowered systolic BP by 3.56 mm Hg and diastolic BP by 2.38 mm Hg. Multiple species of probiotics were found to be more effective, as well as a study duration of at least eight weeks and daily probiotic consumption of at least 1011 colony-forming units. Khalessi S, Sun J, Buys N, Jayasinghe R. Effect of Probiotics on Blood Pressure: A Systematic Review and Meta-Analysis of Randomized, Controlled Trials. *Hypertension.* 2014 Jul 21. doi: 10.1161/HYPERTENSION-AHA.114.03469 [Epub ahead of print] PMID: 25047574

Culinary Herbs for Diabetes
Greenhouse-grown and commercially dried versions of Greek oregano (Origanum vulgare), marjoram (Origanum majorana), rosemary (Rosmarinus officinalis), and Mexican oregano (Lippia graveolens) were tested for their ability to inhibit two enzymes: dipeptidyl peptidase IV (DPP-IV), which plays a role in insulin secretion, and protein tyrosine phosphatase 1B (PTP1B), which is involved in insulin signaling. Both greenhouse and commercial versions showed inhibitory action: greenhouse rosemary, Mexican oregano and marjoram inhibited DPP-IV best, whereas the commercial versions of these same three herbs were best at inhibiting PTP1B. Overall, greenhouse herbs had a higher total polyphenol and flavonoid content. The researchers also report on which of the various phytochemicals found in the herbs likely have the best binding affinities for and inhibitors of DPP-IV. Bower AM, Real Hernandez LM, Berhow MA, de Mejia EG. Bioactive Compounds from Culinary Herbs Inhibit a Molecular Target for Type 2 Diabetes Management, Dipeptidyl Peptidase IV. *J Agric Food Chem.* 2014;62(26):6147–6158. PMID: 24881464

FDA Updates Data on Food Contaminants
In July, the U.S. Food and Drug Administration (FDA) announced the posting of updated data for its Total Diet Study (TDS). Often referred to as the market basket study, TDS is “an ongoing FDA program that determines levels of various contaminants and nutrients in foods.” The updates include findings from foods sampled from 2006 to 2011, and report on levels of the following: arsenic, cadmium, lead, mercury, calcium, copper, iodine, iron, magnesium, manganese, molybdenum, nickel, phosphorus, selenium, sodium and zinc. http://www.fda.gov/Food/ FoodScienceResearch/TotalDietStudy/default.htm

Clinically Relevant Herb-Drug Interactions: Past, Present, and Future
Video of lecture by Bill J. Gurley, PhD, delivered on March 10, 2014 at National Institute of Health (NIH). This talk is part of the Integrative Medicine Research Lecture Series at the National Center for Complementary and Alternative Medicine (NCCAM) at NIH. Watch the full lecture: http://nccam.nih.gov/research/blog/Gurleylecture
Genetic variants in CYP2R1, CYP24A1 and VDR modify the efficacy of vitamin D3 supplementation for increasing serum 25-hydroxyvitamin D levels in a randomized controlled trial. *J Clin Endocrinol Metab.* 2014 Jul 29;jc20141389. [Epub ahead of print] (PubMed ID: 25070320) Gene variants are described which can affect the response to dietary supplementation with vitamin D.


Legal protections provided by the Genetic Information Nondiscrimination Act (GINA) are described. Clinicians are encouraged to pass this information along to their patients.


Nutrigenetics is leading to a better understanding of gene-environment interactions affecting weight gain and obesity. (From within PubMed, click on the Karger icon near the upper-right corner to view the free PDF; accessed 11 Aug, 2014).


Genetic variants in the FADS gene: implications for dietary recommendations for fatty acid intake. *Curr Nutr Rep.* 2014 Jun;3(2):139-148. (PubMed ID: 24977108). There is strong evidence to suggest that dietary recommendations should include consideration of genetic variations, at least at the population level. The FADS family of genes (FADS1, FADS2, etc.) is used as an example, where gene variation frequencies differ considerably between Americans with African or European ancestry.

Low-copper diet as a preventive strategy for Alzheimer's disease. *Neurobiol Aging.* 2014 Sep;35S2:S40-S50. doi: 10.1016/j.neurobiaging.2014.02.031. Epub 2014 May 15. (PubMed ID: 24913894). Both copper deficiency and excess copper can be harmful, especially for those with genetics-related Menkes disease or Wilson disease. Excess copper can also play a role in the development of Alzheimer disease when variants are present in copper-related genes (e.g., ATP7B, ATOX1, and COMMD1).


Environmental, personal, and genetic determinants of response to vitamin D supplementation in older adults. *J Clin Endocrinol Metab.* 2014 Jul;99(7):E1332-40. doi: 10.1210/jc.2013-4101. Epub 2014 Apr 2. (PubMed ID: 24694335). The effect of genetic variants were evaluated in conjunction with supplemental vitamin D, with the CYP2R1 gene having a significant association with responsiveness. The authors conclude that response to dietary supplements can be affected by both the environment and genetics.


Inquiries about above references? Contact Ron L Martin, MS, President, Nutrigenetics Unlimited, Inc.; ron@nutrigenetics.net. Access to the extensive Nutrigenetics.net database is free on weekends, or anytime through October when using October as the username and Free795 as the password. Also, please check out http://www.nutrigenetics.net to learn more about the ISNN membership discount for dietitians, which includes round-the-clock database access as a benefit.
PCOS: The Dietitians Guide
Angela Grassi, MS, RDN, LDN
Haverford, PA; Luca Publishing 2013.199 pp.

PCOS: The Dietitians Guide, in its second edition has been completely revised and updated to include the most recent information about Polycystic Ovary Syndrome (PCOS), how to recognize it and effective treatment options for the condition. The book covers all age ranges as well as conditions that might and do accompany PCOS. 

Up to 10% of women worldwide are affected by PCOS, which is described as a complex genetic disorder or androgen excess, ovulatory dysfunction and polycystic ovaries. Women with PCOS are often affected by other conditions from endometrial cancer to cardiovascular disease risk factors such as obesity, insulin resistance and metabolic syndrome. It is noted that often dietitians are the first to suspect or identify the syndrome due to their work with associated risk factors and conditions.

The first three chapters introduce the reader to what the syndrome is, nutritional and lifestyle strategies and modification, as well as alternative and complementary therapies suggested for PCOS. Chapter one presents information about the syndrome, diagnostic criteria, laboratory values and a brief description of medical treatment. The Nutritional Strategies and Lifestyle Modification chapter provides evidence-based strategies to help women understand how certain foods may impact and the importance of exercise in treatment of risk factors associated with the syndrome. Although titled Alternative and Complementary Treatments, chapter three reviews the variety of dietary supplements and herbal therapies that are useful in treatment, including excellent reviews of safety, side effects and adverse reactions.

Quality of life issues are reviewed so the dietitian can be prepared to address concerns that patients may have or of which they may not be aware. Subsequent chapters discuss the syndrome throughout the lifecycle from adolescence through aging. Each chapter includes information about diagnosis, the syndrome and symptoms, family history, diet, supplement use, medical treatment, physical activity and more. Major issues such as eating disorders and psychological aspects have their own chapters. Angela draws on the expertise of other PCOS experts to help increase the depth of the topic and provides case studies of women with PCOS, following them using the nutrition care process. The Appendix includes questions to ask patients and a toolbox full of suggested patient resources and sample menus.

This reference is an excellent resource for dietitians working in women’s health clinics as well as other health care practitioners in the field of women’s health. It is written from a personal perspective as well as by an expert in the field. It is well worth adding to your library if you work with women of any age.

Reviewed by Sarah Harding Laidlaw, MS, RDN, CDE Editor of The Integrative RDN. Contact Sarah at peaknut70@gmail.com.

Missing Microbes: How the Overuse of Antibiotics is Fueling our Modern Plagues.
Martin J. Blaser, MD
ISBN 978-0805098105
http://martinblaser.com/

To read Missing Microbes is to be reminded that the bodies we consider ours and ours alone, simply aren’t. All humans share our fleshy real estate with an estimated 100 trillion bacterial and fungal organisms, without which we would die. Dr. Martin J. Blaser, director of the Human Microbiome Program at New York University and professor of microbiology, considers the human microbiome a vital organ in its own right. Though our resident bacterial and fungal cells far outnumber our human cells, antibiotics and other modern medical practices are destroying these microbes to our peril. In Missing Microbes, Dr. Blaser sounds an alarm and presents compelling evidence for how the destruction of the human microbiome is leading to increases in chronic diseases including type 1 diabetes, asthma, gastrointestinal reflux disease (GERD), celiac disease, inflammatory bowel disease (IBD), and allergies.

In the early chapters of Missing Microbes, Dr. Blaser ensures the reader has a grounding in microbiome function; learning just how much our microbes do for us inevitably sets the stage for realizing what we are in danger of losing. He also reviews common and formerly-common (thanks to antibiotics) pathogens, the history of antibiotics, and how they are currently used. That is, these “wonder drugs” are dangerously over-prescribed.

Albeit primarily drawing from his own research, Dr. Blaser’s logical arguments are persuasive. Some meander through familiar territory (antibiotic resistant bacteria, cesarean sections prevent infants from acquiring their mother’s flora, pathogens such as Clostridium difficile allowed to flourish after antibiotics decimate competing microbes) while some are entirely new findings, theories, and questions. Dr. Blaser’s lab has linked Helicobacter pylori, known as the ulcer and stomach-cancer causing scourge, to lower incidences of GERD, esophageal adenocarcinoma and asthma. Also noted is that subjects without H. pylori had earlier onset of asthma than those

Continued on pg. 37
with it, suggesting the microbe delays onset of the disease. It is known that antibiotics promote growth in livestock; Dr. Blaser asks, are we not doing the same to our children, who receive multiple courses of antibiotics during childhood? What about the carryover of the drugs into the human food supply via meat, eggs and dairy products?

To be clear, the author is not opposed to antibiotics when necessary. Therein lies the rub. In the last chapter—with the hopeful title of “Solutions”—he calls for physicians and patients to help preserve the effectiveness of antibiotics through judicious use. Dr. Blaser calls for governments to ban antibiotics in livestock production and for scientists to develop narrow-spectrum antibiotics. We all have a role to play in preserving the microbiome, because all of our lives—and the lives of those to come—are at stake.

Jacqueline Santora Zimmerman, MS, RDN is an adolescent medicine nutritionist working with eating disorders and is DIFM’s Associate Newsletter Editor. Contact her at jacq.zimmerman@gmail.com.

MaryBeth Augustine, RDN, CDN, FAND
DIFM Chair, 2014-2015

Dear DIFM Members,

"You have brains in your head. You have feet in your shoes. You can steer yourself any direction you choose. You’re on your own. And you know what you know. And YOU are the one who’ll decide where to go...”¹

The future of integrative nutrition and dietetics practice is bright! In the words of Dr. Seuss, “Congratulations! Today is your day. You’re off to great places! You’re off and away!”¹ According to A Future-Focused Vision for a New Model of Differentiated Entry Level Nutrition and Dietetics Practice, a publication of the Academy of Nutrition and Dietetics Council on Future Practice, the goal of the new model is to prepare graduates from associate, baccalaureate and graduate programs to practice differently, with increased autonomy, greater expertise, and more focused areas of practice at the higher level of the educational continuum.² The great news is that not only is integrative and functional nutrition envisioned in the future of nutrition and dietetics practice, it is positioned at a higher level of practice! According to the future-focused vision report:

The future-focused vision job settings for the graduate RDN include integrative and functional medicine centers, and future-focused vision skills for the graduate level RDN include “applies integrative nutrition principles to nutrition care and medical nutrition therapy (MNT), including the use of nutritional genomics, dietary supplements, and herbal medicine.”²

DIFM members, I couldn’t agree more with Dr. Seuss—in the future-focused vision of nutrition and dietetics practice, “Oh, the places you’ll go!”

Cheers to a bright future,
Mary Beth Augustine, RDN, CDN, FAND
DIFM Chair, 2014-2015

References:
Summer is almost gone and FNCE® is just around the corner. I cannot believe how quickly this year has passed. Before launching into my thoughts about the summer past and the upcoming annual meeting, I want to take the opportunity to say a big THANK YOU to the newsletter team who contribute to making this newsletter the publication it is: Copy Editor Emily Moore, MS, RDN, LDN; Associate Editor Jacqueline Santora Zimmerman, MS, RDN; CPE Editor Shari B. Pollock, MPH, RDN, LDN; Resource Reviews/Networking Editor Dina Ranade RDN; Communications Chair Mary Purdy, MS, RDN; and Communications Associate Chair Malorie Blake, MS, RDN, LDN, CNSC. Without your guidance, support and level-headedness these issues would not be a reality. The reviewers and editors have been invaluable as well, including Danielle Torisky, PhD, RDN and Christian Calaguas, MPH, RDN. And of course the numerous authors of the articles we publish—their expertise and guidance are helping move integrative and functional medicine and nutrition to the spotlight. There are so many members and especially the Executive Committee who have contributed and commented; it is hard to list everyone without being concerned that someone would be forgotten, so let me just say thank you to everyone for all your help!

This summer was a mixed bag of happiness, losses, and moving forward. I hope that next year I can figure out my garden; if it is not one thing it is another with poor rainfall, tomato leaf curl, weeds. There is abundant zucchini from four plants—the one thing that grows like the weeds. The ones that get away from me are fed to the herd of Yaks that pasture in our front field for the summer. They get the weeds, too, when I get around to pulling them. Fortunately we live in an area where farmer’s markets and fresh produce are available; they certainly receive my support! A major road trip with foodie friends to the Northwest offered the opportunity to savor fresh fish and produce and experience the lavender farms the area is well known for. I knew that lavender was calming, but I never realized how fresh lavender could, and would, help me sleep better. Insomniacs out there, take note!

FNCE® is now upon us and this year promises to offer a plethora of sessions for our members focusing on the Emerging Integrative Approaches for Nutrition and Dietetics Practice. I hope that many of you have the opportunity to attend FNCE® and hear the sessions. Please take time to stop by and visit with the EC during the Dietetic Practice Group Showcase and Product Marketplace and provide us your feedback and/or sign up to volunteer. Here you can also learn about the Online Certificate of Training in Integrative and Functional Medicine that will be available in the near future. Look for announcements about the Yoga reception and the sessions of interest to members during the meeting on page 29.

As always, I am open to your comments and offers to help with the newsletter. Please feel free to contact me at peaknut70@gmail.com or 970-216-2356.

Sarah
Excellence in Service
DIFM Excellence in Service Winner,
Esther Trepal, RD, MS, CDN, 2013-2014

Esther Trepal, RD, MS, CDN became a registered dietitian as a second career. She arrived in nutrition through the study of herbs, and was intrigued by the idea that we can use food to heal ourselves. She immediately joined the Academy, and became a member of DIFM. This practice group embodied what she thought of nutrition and the way she wanted to practice. For the past 14 years, she has worked in a variety of settings, including hospitals, clinics and community organizations, educating people with HIV, cancer, diabetes and other chronic medical conditions on how to use food and nutrition to improve their health. Esther currently works at God’s Love We Deliver, an agency in New York City that cooks and delivers food to people who are unable to cook and shop for themselves due to an illness. She is also on the board of directors for Cook for Your Life, an organization that provides cooking information to people whose lives are touched by cancer. Esther holds a Master’s Degree in Nutrition from Teachers College Columbia University in New York City.

Excellence in Practice
DIFM Excellence in Practice Winner, Sudha Raj, PhD, RDN, FAND, 2013-2014

Sudha Raj is an Associate Professor and Graduate Program Director in the Department of Public Health, Food Studies and Nutrition at Syracuse University in New York. Dr. Raj obtained her B.Sc. and M.Sc. degrees in Nutrition and Dietetics from India. She completed her PhD in Nutrition Science from Syracuse University in 1991. She has championed the cause of integrative nutrition by fusing IFM into the course curriculum that she teaches. Her current research interests are in the area of dietary acculturation, organic foods, cultural competency, and vegetarianism as well as integrative and functional nutrition. She teaches both undergraduate and graduate courses in the areas of Food and Culture, Food as Medicine, Vegetarian Diets and an introductory course in Integrative and Functional Nutrition. Dr. Raj is a Registered Dietitian with the Academy of Nutrition and Dietetics. She has served as Chair and Newsletter editor for the Vegetarian Nutrition DPG and is Chair for VN’s Evidence Based Analysis Work Group. Dr. Raj served as the Co-Chair for the SOP/SOPP Workgroup for DIFM in 2011, and was instrumental in getting these standards approved and published. Sudah is a member of the Institute for Functional Medicine, and continually attends IFM learning events, but frequently presents on the topic as well. Sudah states, “I have tried to bring all this to our graduate program, where I see a rising interest in this area in the next generation of dietetic students. I have taught ‘Food as Medicine’ at undergraduate and graduate level for four years, and am now supervising two master’s degree students who are completing their theses on “Attitudes and Practice of the IFMNT Radial among DIFM RDs’, and ‘The Use of Yoga in Developing Mindful Eating Patterns.’” Sudah, the far-reaching impact of your integrative nutrition teaching will no doubt plant the seeds for many successful RDNs to touch the lives and health of others at a level not often seen. We thank you for your dedication to our profession and the practice of integrative nutrition.
Janet Lacey is a professor in the Department of Nutrition at West Chester University of Pennsylvania. Her courses include macro- and micronutrients, food science, and vegetarian nutrition. Recently, Janet developed a workshop on Food for Mind and Spirit, focusing on mindful eating, religious and spiritual practices related to food, and a nutritional approach to optimizing brain health through the life cycle. Janet previously taught in the Department of Nutrition at Simmons College and provided weight-loss programs and counseling for morbidly obese patients at Boston Medical Center. Her research has focused on vegetarian diets, and calcium and zinc adequacy. Janet is the past-chair of the Vegetarian Nutrition DPG. She is the author of Fields of Nourishment: Plant-Based Recipes with their Nutrient Profiles (Infinity Publishing, 2011).

Janet attended Mind, Mood and Food: Optimal Nutrition for the Brain, a Food as Medicine Seminar, in March of 2014. Her review of this conference is in the Fall issue of The Integrative RDN Newsletter. Congratulations, Janet, and thank you for inspiring DIFM members with this important topic!

Natasha Eziquiel-Shriro attends CUNY-Hunter College school of Public Health in New York, New York, and expects to complete her Master’s in Nutrition in the Spring of 2015. Her personal mission is to help and empower others to reduce nutrition-related health disparities, and promote the consumption of whole foods, mind-body healing, and integrative approaches to wellness. She currently is a research assistant for the NYC Food Policy Center. She has served as a Nutritionist and Culinary Specialist for the seasonal Stellar Farmer’s Markets Program, providing nutrition education and cooking demonstrations to promote increased vegetable and fruit consumption. Natasha has also served as a Program Coordinator for Edible Schoolyard NYC, a school-based garden and cooking program for children. She also has strong community involvement, currently serving as a Lead Organizer for Food Allies in Brooklyn. She has raised significant funding for the group, created and distributed a sustainable food resource guide, and organized a Health and Harvest Fair in conjunction with Food Day 2012.

Natasha attended the September 2014 Food As Medicine conference. In preparation she stated, “As a student of nutrition science, I would like to gain the knowledge and skills needed to bring a holistic and integrative approach to my counseling of patients who are aware of the importance of nutrition to good health, as well as patients who have yet to understand the deep connection between food, health, and overall well-being.” Natasha’s review of the Food As Medicine conference proceedings will be shared in a future issue of The Integrative RDN newsletter.
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