Nutrition and Pain Management: Putting Pain Relief on the Menu
Nancy Ann Cotter, MD

CPE Objectives:
After reading this article, the nutrition professional will be able to:
1. Discuss three mechanisms that explain the relationship between nutrition and pain.
2. Describe the basic components of an anti-inflammatory diet and the contribution of each component to balancing inflammation levels in the body.
3. List three chronic pain conditions which have been shown to be directly related to nutrient insufficiencies.
4. Recognize the potential role of the microbiome in modulation of inflammation and pain.

Introduction and Context
With the current opioid epidemic, nonpharmacologic pain management is receiving unprecedented attention. In a widely reported clinical practice guideline, the American College of Physicians recommends trials of evidence-based nonpharmacologic modalities—acupuncture, exercise, cognitive behavioral therapies—before pharmacologic treatments for chronic pain. Dietary interventions are noticeably absent from this list of evidence-based approaches to pain management.

Is there no evidence base for nutrition in pain management? To the contrary—evidence exists, but the connection between food and pain is multifactorial, and cause and effect is not always linear. This article will review evidence in four distinct areas of the relationship between nutrition and pain: nutrient insufficiencies, inflammatory load, the potential role of the microbiome, and overall eating patterns.

Before describing such mechanisms, let us look at why nutrition may not currently be on the short list of nonpharmacologic pain management interventions.

Nutritional therapy for pain has been used in nonwestern systems of healing, such as Chinese Medicine and Ayurveda, for thousands of years. In modern pain management, we think of pain diagnosis in terms of identifying pain generators, such as an arthritic hip, a damaged nerve, or a sprained muscle. We seek ways to repair structural damage, block discrete receptors, or inhibit specific pathways. A nutritional approach to pain is fundamentally different. Instead of isolating one cause and correcting the corresponding culprit, the nutritional approach is global, in support of the whole organism’s innate ability to heal, and often works preventively.

There are economic factors that influence the lack of awareness of the benefits of nutrition for pain management. The financial return on investment for studying nutritional remedies for pain is low. An anti-inflammatory diet cannot be patented, and well-designed nutritional studies can be lengthy, laborious, and do not lead to the development of a new product. In addition, nutrition professionals are not always included as key...
members of the medical team. However, understanding the science and using current evidence to support greater awareness and advocacy will help put nutrition on the map for treatment of chronic pain.

Nutrient Insufficiencies

If we look for a nutrient insufficiency model to link pain and nutrition, there are a few micronutrients that stand out.

Magnesium

Magnesium is necessary for over 300 physiologic reactions, and magnesium deficiency is estimated to be widespread and rising in the US and Canada. Magnesium deficiency is associated with migraine headaches, and repletion is associated with prevention of headaches as well as treatment of acute migraine. Magnesium administration has been associated with relief of premenstrual syndrome (PMS) and fibromyalgia. Recommended oral dosages are 400-600 mg per day.

Vitamin C

Vitamin C is important for bone healing and collagen crosslinking, as well as its role as an antioxidant.

In order to investigate whether vitamin C may prevent the development of complex regional pain syndrome (CRPS), Zollinger et al followed a group of 317 patients with wrist fractures who were randomized to receive either 200, 500, or 1500 mg of vitamin C and 99 patients who were randomized to receive a placebo. The prevalence of CRPS was 2.4% in the vitamin C group and 10.1% in the placebo group; all the affected patients were elderly women who may have been nutrient deficient. The prevalence of CRPS was 4.2%, 1.8%, and 1.7% in the 200, 500, and 1500 mg groups respectively. The optimal dosage of 500 mg has been confirmed by subsequent studies.

A group of Canadian researchers examined the associations between serum vitamin C concentration and the prevalence of spinal pain and functional limitations in over 4000 adults in the general US population using data from the 2003-2004 US National Health and Nutrition Examination Survey (NHANES). Suboptimal serum vitamin C concentrations were associated with the prevalence of neck pain and low back pain in the previous three months and related functional limitation score.

Vitamin C decreases the requirement for opioid analgesics, especially post surgically, and may be effective for cancer pain and for pain associated with chronic pancreatitis.

Other Nutrients of Concern

Good evidence exists for the use of intravenous alpha lipoic acid for diabetic neuropathy, and some studies show a benefit of an oral dose of 600 mg with and without vitamin B12.

Preliminary evidence exists for a preventative effect of vitamin D and B vitamins on pain of various etiologies, but there is not enough evidence to make clinical recommendations at this time.

Nutrient groups such as phytonutrients and essential fatty acids are best discussed within the context of dietary eating patterns (below).

Pain and Inflammatory Load

Nearly all pain has a component of inflammation.

This can be profoundly influenced by diet. A pro-inflammatory diet, such as the Standard American Diet (SAD), contains several elements that promote systemic inflammation; and there are a number of diets that are considered anti-inflammatory. Below is a table comparing the dietary components that determine the degree of inflammation contributed by diet.

<table>
<thead>
<tr>
<th>Pro-inflammatory Diet</th>
<th>Anti-inflammatory Diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pro-inflammatory balance of fats; trans fats</td>
<td>Anti-inflammatory balance of fats</td>
</tr>
<tr>
<td>Low in phytoneutrients</td>
<td>High in phytoneutrients/spices</td>
</tr>
<tr>
<td>Low fiber</td>
<td>High fiber</td>
</tr>
<tr>
<td>High glycemicload</td>
<td>Low glycemicload</td>
</tr>
<tr>
<td>High in animal protein</td>
<td>Low to moderate animal protein</td>
</tr>
<tr>
<td>Highly processed</td>
<td>Basic preparation</td>
</tr>
</tbody>
</table>

Table 1: Pro-inflammatory and anti-inflammatory dietary components

Fat balance

Dietary fat is one of the most important determinants of the inflammatory load. The content of dietary fat will determine the essential fatty acid (EFA) balance that is metabolized by the EFA pathway. The essential fats linoleic acid (LA) and alpha linolenic acid (ALA) are called essential because they are not manufactured in the body and must come from the diet.

The pro-inflammatory omega-6 pathway begins with LA and produces arachidonic acid, the precursor to pro-inflammatory cytokines, prostaglandins, thromboxane, and leukotrienes. Prostaglandins sensitize peripheral nociceptors (pain receptors), while leukotrienes increase vascular permeability. The cytokines produced by the pro-inflammatory pathway are responsible for multiple aspects of the inflammatory process, including the initiation and persistence of pain. These proteins can sensitize nociceptive neurons, contribute to central sensitization, and influence the development of hyperalgesia and allodynia.

The anti-inflammatory omega-3 (ω-3) pathway begins with ALA and produces eicosapentaenoic acid and...
A whole foods, plant-based diet. Fibromyalgia has experienced decreased pain and patients with osteoarthritis were associated with decreased incidence of peripheral neuropathy in the elderly, which can be extremely painful.

**Antioxidant Phytonutrients**

Chronic inflammation produces free radicals, which can deplete stores of antioxidants and lead to a state of oxidative stress, or “inflammaging.” Certain nutrients, such as magnesium and zinc, are cofactors in key enzymatic reactions that dismantle free radicals. Others, such as vitamin C and phytonutrients, are dietary antioxidants that quench oxidation. When cofactors and coenzymes are deficient, oxidation increases.

We know that fruits and vegetables, herbs and spices, and green tea contain bioactive compounds such as flavonoids, carotenoids, and proanthocyanidins. These compounds reduce the oxidative stress that results from chronic inflammation. There is evidence that soy foods may contribute to pain reduction. Data from the British Cohort study, which follows children from birth, revealed an association between a decreased intake of fruits and vegetables and chronic widespread pain. Pain scores of patients with knee pain decreased significantly with increased intake of fruits and vegetables and patients with osteoarthritis experienced decreased pain with a whole foods, plant-based diet. Fibromyalgia has been shown to be responsive to vegetarian diets, and a higher consumption of fruits and vegetables has a protective effect for gout. Isolated phytonutrients have been associated with decreased postsurgical pain, reduced lower extremity pain, and less exercise–induced muscle soreness. There is a robust literature devoted to the anti-inflammatory properties of green and black tea as well as many herbs, covered later in this issue.

**Fiber and Glycemic Load**

Carbohydrate foods influence the inflammatory process. There is a correlation between postprandial glucose concentration, oxidant stress, and inflammation. Fiber in the diet slows absorption time of sugars and helps to optimize glucose metabolism, which avoids a high glycemic load and an insulin-driven rise in C-reactive protein (CRP). Some types of fiber act as prebiotics and support growth of symbionts (helpful bacteria) in the intestine, promoting a diverse microbiome and balanced immune response. The degree of “westernization” of a diet is associated with a decrease in microbial diversity, which includes organisms that process fiber-rich dietary components.

Reviews of the data of two prospective studies—the Osteoarthritis Initiative and the Framingham Offspring Osteoarthritis Study—show that dietary fiber was significantly and inversely associated with worsening of knee pain in people with osteoarthritis. An analysis of more than 15,000 NHANES participants showed significant associations between systemic inflammation, as indicated by high levels of CRP, and low back pain, especially in those who were obese.

**Protein**

Protein from conventionally-raised animals, with a higher content of arachidonic acid than grass-fed animals, may contribute to inflammation. Cold-water fish contribute ω-3 fatty acids, which help to modulate the inflammatory response. Proteins found in plants, such as legumes and vegetables, are accompanied by phytonutrients.

**The Gut Microbiome and Pain Modulation**

The term microbiome refers not only to the microbes in a specific environment but also to the environment that they inhabit. The gut microbiome includes the gut epithelium, immune components, and products of both the microbes and host, including metabolites. Microbiota refers to the organisms themselves. The gut microbiota is comprised of approximately 100 trillion cells and it has been compared to a separate organ in terms of the complexity of its metabolic activity. This metabolic activity is linked to multiple chronic conditions: metabolic syndrome, obesity, and cardiovascular disease. Beneficial bacteria act to block pathogen colonization by competing for nutrients and space and by synthesis of bacteriocidal products, vitamin production, and modulation of inflammation. Although there is no linear connection between the microbiome and pain, there are multiple complex relationships to be considered. Gut microbes play an important part in the maintenance of systems that contribute to pain modulation. Microbes in the gut produce B vitamins and vitamin K; the B vitamins especially are important cofactors for methylation and essential fatty acid metabolism, which in turn are part of the landscape of inflammation. Gut microbes convert nutrients such as lignans and isoflavones to their usable forms. Among other functions, both contribute to modulation of inflammation. As we have seen previously, systemic inflammation...
Some beneficial bacteria have immunomodulating effects, which in some cases may depend on the health status of the host: down-regulating immune function in people with immune system hypersensitivity and stimulating it in healthy people. Lastly, the manipulation of some microbial species by use of prebiotic foods may decrease visceral pain.

Beneficial bacteria play an important role in the maintenance of a healthy enterocyte layer in the intestinal tract. The interaction of microbiota with the immune system affects secretory IgA, release of antimicrobial substances, and maintenance of the protective mucosal layer.

An aspect of nutrition and pain management that cannot go unmentioned is food sensitivity and the resulting increased gut permeability as a source of inflammation, autoimmunity, pain, and physical dysfunction. Although an in-depth review is outside of the scope of this article, it is reviewed well elsewhere.

In essence, the gut microbiome interacts with multiple metabolic processes that then have an effect on pain and chronic conditions associated with pain and may be used in support of nutritional pain management approaches.

Examples of Anti-inflammatory Eating Patterns

Three eating patterns from diverse areas of the world—the Mediterranean Diet, the Okinawan Diet, and the diet of the Native Kuna in Panama—all use foods native to the geographic region from which they originate.

The Mediterranean Diet utilizes native olives and olive oil, the Okinawan Diet is rich in seafood and sea vegetables, and the Kuna diet contains a great deal of flavanol-rich cacao. At the same time, each illustrates the qualities of plant-based, high fiber, low glycemic diets with high quality protein.

Conclusion

The use of nutrition for pain management is an evidence-based nonpharmacologic intervention that can contribute significantly to a comprehensive approach to chronic pain. Although the evidence base is not complete, there is data that shows relationships at the level of single nutrients as well as dietary patterns.

Our success in establishing dietary intervention as fundamental to pain management depends in part on our ability to guide health care practitioners and patients to recognize its role and to understand the nature of its contribution.

It may be helpful to guide patients and their referring clinicians about the theoretical basis for this approach, as well as the scope, timeline, and potential limitations of using nutrition for pain management. Nutrition should be recommended as part of a long-term strategy for managing chronic pain, instituted gradually while shorter-acting therapies (eg, acupuncture, medication, manual therapies) are used to provide pain relief in the near term. As patients experience pain relief with other modalities, they are more able to make changes in dietary habits.

It is helpful to provide some guidance for patient expectations. With an anti-inflammatory diet, improvement (increased function or decreased need for medication) will often be noticed in 3-6 weeks. For patients who may be reacting to specific foods, partial pain relief may be evident in a shorter time period after such foods are removed. Although dietary change is potent, it is rarely the only tool needed for relief from chronic pain and is best used as part of a multi-modality approach. Often, nutritional therapy potentiates the success of other modalities.

Nutrition intervention for chronic pain care is not yet as widespread as it is for other chronic conditions, such as cardiovascular disease and diabetes. Reasons for this include lack of training on the part of providers, market forces, and time pressure in the office. As we better understand the relationship between dietary patterns, the microbiome, immune modulation, and pain, the contribution of nutrition to pain prevention and treatment will become more evident. By educating both patients and providers about the powerful role nutrition can play, registered dietitian nutritionists can take the lead in bringing dietary interventions to the forefront of chronic pain management.
Figure 1: Essential Fatty Acid Pathway

With permission, courtesy of Adam Rindfleisch, MD, University of Wisconsin Integrative Health, Veterans Health Administration Office of Patient Centered Care and Cultural Transformation
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29. Li S, Micheletri R. Role of diet in rheumatic disease. Rheum Dis


Young VB. The role of the microbiome in human health and disease: an introduction for clinicians. BMJ. 2017;356:j831. doi:10.1136/bmj.j831


Young VB. The role of the microbiome in human health and disease: an introduction for clinicians. BMJ. 2017;356:j831. doi:10.1136/bmj.j831


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Questions:

1. Which of the following nutrients has been shown to decrease the requirement for opioid analgesics postoperatively?
   - A. Magnesium
   - B. Alpha linolenic acid
   - C. Vitamin C
   - D. Alpha lipoic acid

2. Which of the following was shown to be inversely associated with worsening of knee pain in people with osteoarthritis?
   - A. Phytonutrients
   - B. Dietary fiber
   - C. Protein intake
   - D. Glycemic load

3. Pro-inflammatory cytokines are derived from which of the following?
   - A. Eicosapentaenoic acid
   - B. Alpha linolenic acid
   - C. Docosohexaenoic acid
   - D. Arachidonic acid

4. The gut microbiota has been compared to a separate organ due to its:
   - A. Ability to block pathogen colonization
   - B. Complex metabolic activity
   - C. Immunomodulating effects
   - D. Effect on pain and chronic conditions

5. An anti-inflammatory diet would include which of the following dietary components?
   - A. Low glycemic load, high fiber, high in phytonutrients
   - B. Low to moderate animal protein, minimal trans fats, low fiber
   - C. High omega-6 to omega-3 ratio, high glycemic low, high fiber
   - D. Whole/minimally processed foods, high animal protein, low phytonutrients
Putting Pain Relief on the Menu

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How Research Translates to Supplement Innovation

Kelly C Heim, PhD, and Juniper Devecis, MS, RD, CCN

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Juniper Devecis, MS, RD, CCN, is the Director of Product Development at Pure Encapsulations. She has a master’s degree in nutritional biochemistry from Tufts University and completed her dietitian training at Beth Israel Deaconess Medical Center. She coordinates and manages the development process for new and improved dietary supplement products and provides technical support and training for the sales team. Contact Juniper at JDevecis@purecaps.com.

As functional medicine practitioners, you know the important role proper supplementation can have when counseling clients. While supplements are a critical tool for practitioners, few understand the rigorous process and vast amount of research that goes into developing and formulating high-quality supplements.

To shed some light on the innovation and research process behind our supplements, we spoke with Kelly Heim, PhD, a nutritional pharmacologist and Senior Director of Scientific Affairs for Pure Encapsulations, and Juniper Devecis, MS, RD, Director of Product Development for Pure Encapsulations.

How do you decide which products to develop?

Juniper: It is the goal of the research and product development teams to collaborate across our team of scientific and medical experts to formulate effective products using optimal ingredient levels in premium forms to improve the health of those who use them. We are constantly monitoring research advances and technological innovations in nutrient delivery and considering the needs of our medical advisors and health professional customer base to determine what products may be best for development. Once we find a need, we compile a thorough research review and examine the efficacy, safety, and effective dosing for optimal support.

How do you formulate products?

Kelly: Efficacy in clinical practice is vital. Our team here at Pure Encapsulations works closely with our medical advisors, who specialize across a variety of disciplines including genomics, mental health and emotional well-being, weight management, immunology, and more, when creating new products. We have more than 400 product formulations, and we continually work with our medical team to innovate and align with what the published research supports and what they are seeing in their clinical practices. Our medical advisors are able to put scientifically supported products to the test. They have developed a series of protocols based on their experience with the effectiveness of our products. Additionally, we invest heavily in academic research with leading institutions and develop new products based on published, peer-reviewed studies.

How do you source your ingredients?

Juniper: Once we have a sufficient body of evidence to indicate that a product may provide health benefits, we work to find the optimal source. When sourcing raw ingredients, we selectively partner with suppliers from around the world whose quality standards match the rigor of our own. We have a rigorous qualification process where we examine the suppliers’ standard operating and other procedures, manufacturing quality and techniques, and inspect the facilities. Once a supplier has been qualified, we then require thorough documentation on the raw materials themselves, including manufacturing processes, test results, stability, GMO exposure, allergen exposure, and other material properties.

In order to ensure the highest and purest quality, raw materials are also independently tested for purity, potency, solvents, microbials, heavy metals, and other potential contaminants by our third-party laboratories before entering our facility. We also perform finished product testing as an added measure of quality control.

Kelly: When it comes to sourcing ingredients, bioavailability is always at the top of our list. We always work to source the highest quality ingredients in their most bioavailable form so our end products can deliver predictable, desired results.

To what degree are your products backed by research?

Kelly: Research serves as the backbone of product innovation and development. As part of our long-standing practice of research-driven formulation, we focus only on nutritional interventions backed by competent scientific evidence. This enables practitioners to confidently apply them in practice for reliable and consistent results.
What are some examples of recent products developed as a result of your research collaborations?

Kelly: The clinical utility of polyphenols in relation to cognitive health has become a major focus of research. There is an increasing body of evidence that suggests polyphenols from fruits such as blueberries and grapes support memory and neurological health as we age. In an effort to provide new and effective options for cognitive support, Pure Encapsulations’ parent company, Atrium Innovations, has partnered with the Institute of Nutrition and Functional Foods (INAF), Diana Foods, and other French and Canadian researchers and commercial partners to conduct the Neurophenols project, an international research initiative dedicated to developing and marketing innovative natural products to support neurocognitive health. A unique blend of standardized wild blueberry and Bordeaux grape extracts, called Neurophenol®, was found to have neuroprotective properties and support spatial and recognition memory in preclinical cognitive studies. In a recent randomized, double-blind, placebo-controlled clinical trial of healthy adults between the ages of 60 and 70, Neurophenol® provided significant support for episodic memory. Researchers found that the polyphenol supplement supported memory in this population of healthy, older subjects. The benefit was most significant in subjects with initial cognitive performances in the lowest quartile of the normal range. This study demonstrated that Neurophenol® is a useful modality in maintaining cognitive function in aging individuals. First-to-market products containing this proprietary blend of polyphenols are already available from Pure Encapsulations.

In addition, we’ve also collaborated with research partners to make discoveries on the clinical applications of polyphenols, fish oil, and systemic enzymes and their role in improving cardiometabolic health outcomes.

This article was sponsored on behalf of Pure Encapsulations.

For Pure Encapsulations full research compendium, visit: http://blog.pureencapsulations.com/research-compendium/

‡These statements have not been evaluated by the Food & Drug Administration. These products are not intended to diagnose, treat, cure, or prevent any disease.
The charge to relieve suffering presents challenges to a health care practitioner. An estimated 116 million Americans live with chronic pain, ranking it among the top reasons for physician visits. As the opioid crisis escalates, physicians face prescribing dilemmas, and patients fear restricted access to pain medications. Recently published guidelines from the American College of Physicians recommend optimal strategies use nonpharmacologic options with fewer associated harms. Acupuncture, mindfulness-based stress reduction, yoga, and spinal manipulation are listed, among others. The exclusion of botanical medicine reflects ongoing product quality control and adverse effect concerns. Fear, lack of experience, and limited (although increasing) scientific study compound these questions; however, herbalism offers promise for pain management. Botanical medicines, if applied with care and knowledge, assist other systems to promote wellbeing while decreasing pain and discomfort. Skillful use can relieve suffering and nourish repair of chronic pain etiology.

Use of plants for analgesia dates centuries before pharmaceuticals existed. Narcotic alkaloids and salicylic acid originate from botanicals. Opium is the milky exudate from the white poppy (Papaver somniferum) with further derivatives of morphone and codeine as narcotic salts. Textbooks written by respected eclectic physicians in the early 1900s warn of the long-term dangers from high-dose narcotics. Recommendations to reserve opioids for acute, severe pain from wound or injury, avoid careless prescribing, and substitute other agents especially in chronic pain conditions echo today’s guidelines.

Chronic pain, persisting or reoccurring greater than three to six months, arises from prolonged sensory perception in the presence of inflammation or ongoing nociceptor activity. The three types of pain—inflammatory, nociceptive, and neuropathic—can be treated more effectively if identified and targeted specifically. This differential approach illustrates the core philosophy of botanical medicine.

Nonaddictive herbal medicines, while not as potent as pharmaceuticals, offer specificity. Weaker does not equate to ineffective. For highest potential, best practice employs attention to synergy, working with body systems, and proper formulation. A differential approach targets and manages unique, individual pain manifestations. Through multifaceted actions, herbs can improve quality of life, especially for sensitive groups such as the elderly. In addition to pain relief, it is possible to protect, strengthen, and nourish the nervous system overall.

Stellar assessment is the first step to botanical pain management. As in a detailed nutritional assessment, specific descriptions matter—pain location; how it feels (sharp, stabbing, dull, aching); and intensity scaling from one to ten. Specificity offsets milder-acting analgesia and increases pain-relieving potential. See Tables 1 and 2 for examples.

Focusing on herbal action rather than indication blends the art and science of herbalism. The chemistry of a plant, its phyrochemicals, generate its actions. An herb’s actions shed light on the outcome of its use or effect in the body. The language of herbal action parallels medical terminology in a way that fosters understanding of appropriate use. Herbal actions specific to pain relief include analgesic, anti-inflammatory, antinociceptive, and antispasmodic. Additional actions reinforce and improve well-being including nerve, adaptogen, antidepressant, and anxiolytic. Many herbs exhibit several of these actions. Knowing a plant’s herbal actions and specific affinities aids in choosing botanical medicines. A plant that is anti-inflammatory and antispasmodic in action with affinity for the genitourinary system, while a good choice for menstrual cramps, would not be best for osteoarthritis, where a stronger analgesic antinociceptive is indicated. A person experiencing a high degree of mental anguish and anxiety from their pain can also benefit from calming nerve and adaptogenic herbs.

Herbal actions help target treatment for specific types of pain. Analgesic herbs, or anodynes, reduce pain through their effect on the nervous system. Anti-inflammatory herbs, rather than blocking inflammation, change conditions in the tissues that then promote healing. An herb that has anti-inflammatory action may not necessarily relieve pain, but instead may calm redness, heat and swelling, all symptoms that contribute to pain from injury or infection. Additional benefit occurs when used in combination with other herbs to address underlying problems. Antispasmodic herbs prevent or relieve spasms or muscle cramps and reduce
muscular tension. Many are also nervines which help relaxation without sedation. Antinociceptive herbs decrease nerve sensation to allow distance from pain thus increasing tolerance. A noxious receptor at the end of a neuron’s axon, detects potential threats then sends messages to the brain and spinal cord to respond. Sensory pain is activated by extreme temperatures, intense pressure, and chemicals signaling actual or potential tissue damage. Attention to nociceptive pain is especially critical in chronic pain experienced in osteoarthritis, low back pain, and fibromyalgia.

Tables 3-6 list examples but are not meant to be all-inclusive. Dosage is dependent on physiological impact or strength of an herb, the desired effect, and the individual, including their age, weight, and constitution. Contraindications should be researched prior to use from reputable sources such as the Botanical Safety Handbook.

Formulation considers herbal actions which, when tailored to the individual, impacts relief. Strategically crafted formulas that incorporate several herbal actions matched to unique symptoms are preferred over single herbs. Careful herb combining creates synergy that potentiates strength. Synergy is the complex interaction different plants work together to create potentiating and stabilizing effects beyond what would be expected if only one plant was used. One plus one equals three or four or five.

An Example of Synergy and Efficacy

Willow (Salix spp) demonstrates differences between botanical medicine and pharmaceuticals, importance of synergy, and proper study design. Documented use of willow for pain relief dates from 4000 BCE. Early 19th century chemists isolated salicin from willow, eventually leading to the development of acetylsalicylate and aspirin. Willow is not as strong as aspirin but is slower acting, so analgesia lasts longer. Several human studies support willow bark extract as an effective analgesic and anti-inflammatory. Chemical analysis reveals, in addition to salicin, eleven salicin-related compounds as well as polyphenolics and flavonoids present in willow that contribute to these effects without the side effects associated with aspirin. Additionally, salicin lacks aspirin’s acetyl residue which binds to thromboxane synthetase. Unlike aspirin, willow does not cause inhibition of platelet aggregation so has less effect on blood thinning.

Willow’s full potential may yet be uncovered through further study. The species appearing in current studies, white willow (Salix alba), contains the lowest salicin levels of all willow species at 0.5% in comparison to crack willow (Salix fragilis) at 1-10% and purple willow (Salix purpurea) at 3-9%. Reliance on study design without specificity, synergy, and formulation may result in mixed conclusions as attention to these details are elements of best practice.

Take-Home Message

While the use of herbal medicines for pain management addresses concerns of addiction and side effects from pharmaceuticals, to use them as replacements is not using them as they should be used. To suggest a person taking aspirin change to willow will likely lead to misuse and disappointment. Utilizing a differential approach to create individual botanical formulas holds the highest potential for effective pain management.

The highly uncomfortable physical, emotional, and cognitive experience of pain is individual and subjective, further intensified by stress and anticipation. The beauty of utilizing botanicals in pain management is the ability to customize treatment to type and pain location thereby contributing to the resolution of an underlying causal condition without dependence on the remedy. Well-crafted formulas, like specific meal plans, necessitate experience and knowledge of ingredients. RDNs, well versed in the individual approach to healing, can offer immediate support using food herbs with pain-relieving potential while providing encouragement through referral to a clinical herbalist or physician who incorporates herbal medicine into their practice.
### Table 3: Analgesic Herbs\(^{11-13}\)

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Latin Name/ Plant Family</th>
<th>Plant Part Used</th>
<th>Medicinal Preparations</th>
<th>Specific Pain Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Cohosh</td>
<td>Actaea racemosa/ Ranunculaceae</td>
<td>Fresh root</td>
<td>Tea decoction Tincture Powder (topical) Vinegar tincture</td>
<td>Dysmenorrhea; skeletal muscle relaxation; sore or bruised muscles, especially back, pelvis, thighs; trigeminal neuralgia; fibromyalgia</td>
</tr>
<tr>
<td>Corydalis</td>
<td>Corydalis yanhusuo/ Papaveraceae</td>
<td>Rhizome</td>
<td>Tea decoction Tincture Capsule</td>
<td>Abdominal, intestinal, hepatic pain; gallbladder spasms; hernia pain; dysmenorrhea; cancer pain; also antispasmodic, antiinflammatory</td>
</tr>
<tr>
<td>Devil’s Claw</td>
<td>Harpagophytum procumbens/ Pedalilceae</td>
<td>Tuber</td>
<td>Tea decoction Tincture Enteric-coated capsules</td>
<td>Osteoarthritis: stiff, painful joints; neuralgia; tendinitis</td>
</tr>
<tr>
<td>Frankincense</td>
<td>Boswellia sacra/ Bursaraceae</td>
<td>Gum resin</td>
<td>Tea decoction Tincture Capsule</td>
<td>Traumatic injury, bruises, muscle sprains, rheumatoid arthritis</td>
</tr>
<tr>
<td>Jamaica Dogwood</td>
<td>Piscidia piscipula/ Fabiaceae</td>
<td>Bark and root bark</td>
<td>Tea decoction Tincture Capsule</td>
<td>Severe menstrual pain, facial nerve pain, optic neuralgia, toothache, back and muscle pain, sciatica, acute injury, insomnina from pain</td>
</tr>
<tr>
<td>Meadowsweet</td>
<td>Filipendula ulmaria/ Rosaceae</td>
<td>Flowering tops</td>
<td>Tea infusion Tincture</td>
<td>Arthritis, back pain, headaches, symptoms</td>
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<tr>
<td>St. John’s Wort</td>
<td>Hypericum perforatum/ Hyperiaceae</td>
<td>Flowers</td>
<td>Tea infusion Tincture Capsule Oil, liniment, salve (topical)</td>
<td>Internally and topically: nerve pain, sciatica, shingles, spinal injury</td>
</tr>
<tr>
<td>Willow</td>
<td>Salix spp/ Salicaceae</td>
<td>Bark</td>
<td>Tea decoction Tincture</td>
<td>Arthritis, rheumatoid arthritis, burstis, back pain, headaches, muscle strain, fibromyalgia, interstitial cystis</td>
</tr>
<tr>
<td>Yellow Sweet Clover</td>
<td>Mellilotus officinalis/ Fabiaceae</td>
<td>Flowering tops</td>
<td>Tea infusion Tincture</td>
<td>Sharp, stabbing pain; migraines, optic neuralgia, sciatica, brachial nerve pain, ovarian neuralgia, traumatic injury</td>
</tr>
</tbody>
</table>

### Table 4: Anti-inflammatory Herbs\(^{11-13}\)

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Latin Name/ Plant Family</th>
<th>Plant Part Used</th>
<th>Medicinal Preparations</th>
<th>Specific Pain Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achyranthes</td>
<td>Achyranthes bidentata/ Amaranthaceae</td>
<td>Root</td>
<td>Tea decoction Tincture</td>
<td>Traumatic &amp; sports injuries, sprains, muscle strain, tendinitis, low back pain, sciatica; rheumatoid arthritis</td>
</tr>
<tr>
<td>Arnica</td>
<td>Arnica sp/ Asteraceae</td>
<td>Flowers</td>
<td>Tea infusion as compress Tincture Oil, liniment, or salve (topical)</td>
<td>Topically for bruises, strain, sprains; sciatica fibromyalgia, back pain; best immediately after injury</td>
</tr>
<tr>
<td>Boswellia</td>
<td>Boswellia serrata/ Bursaraceae</td>
<td>Gum resin</td>
<td>Tea decoction Tincture Capsules</td>
<td>Arthritis with spasms and worse with dampness; inflammatory bowel disease; rheumatoid arthritis; traumatic injury, ie, bruises, sprains (topical)</td>
</tr>
<tr>
<td>Chamomile</td>
<td>Matricaria recutita/ Asteraceae</td>
<td>Flowers</td>
<td>Tea infusion Tincture</td>
<td>Tension headaches, stress-induced gastric upset, relaxant</td>
</tr>
<tr>
<td>Gotu kola</td>
<td>Centella asiatica/ Apiaceae</td>
<td>Herb (whole plant)</td>
<td>Tea infusion Tincture</td>
<td>Rheumatoid arthritis, red hot inflamed skin conditions, gastric pain, interstitial cystis</td>
</tr>
<tr>
<td>Mullein</td>
<td>Verbascum thapsus/ Scrophulariaceae</td>
<td>Root</td>
<td>Tea decoction Tincture</td>
<td>Facial nerve pain, spasmodic pain</td>
</tr>
<tr>
<td>Sarsaparilla</td>
<td>Similax officinalis/ Liliaceae</td>
<td>Rhizome</td>
<td>Tea decoction Tincture</td>
<td>Skin inflammations, rheumatoid &amp; psoriatic arthritis, burstis, sciatica</td>
</tr>
<tr>
<td>Sichuan Teasel</td>
<td>Dipsoas asperoides/ Dipsoasaceae</td>
<td>Root</td>
<td>Tea decoction Tincture Liniment (topical)</td>
<td>Low back pain, stiff joints, arthritis, sciatica, traumatic injuries</td>
</tr>
<tr>
<td>Solomon’s Seal</td>
<td>Polygonatum biflorum/ Ruscaceae</td>
<td>Rhizome</td>
<td>Tea decoction Tincture</td>
<td>Injury to joints, tendons, cartilage; compressed spinal disc injury</td>
</tr>
<tr>
<td>Turmeric</td>
<td>Curcuma longa/ Zingiberaceae</td>
<td>Rhizome</td>
<td>Tea infusion Tincture Capsules</td>
<td>Osteoarthritis, rheumatoid arthritis, burstis; inflammatory diseases of GI tract</td>
</tr>
</tbody>
</table>

### Table 5: Antinociceptive Herbs\(^{11-13}\)

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Latin Name/ Plant Family</th>
<th>Plant Part Used</th>
<th>Medicinal Preparations</th>
<th>Specific Pain Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashwagandha</td>
<td>Withania somnifera/ Solanaceae</td>
<td>Root</td>
<td>Tea decoction Tincture Capsule</td>
<td>Fibromyalgia, rheumatic pain, osteoarthritis, pain-induced insomnia</td>
</tr>
<tr>
<td>Cyperus</td>
<td>Cyperus rotundus/ Cyperaceae</td>
<td>Tuber</td>
<td>Tea infusion Tincture</td>
<td>Gynecological &amp; abdominal pain: gas, cramping, dysmenorrhea, ovarian cysts, endometriosis, fibroids</td>
</tr>
<tr>
<td>Indian Pipe</td>
<td>Monotropa uniflora/ Ericaceae</td>
<td>Root and plant top</td>
<td>Tea decoction Tincture</td>
<td>Increases pain threshold and tolerance, cancer pain</td>
</tr>
<tr>
<td>Mimosa Bark</td>
<td>Albizia julibrissin/ Fabiaceae</td>
<td>Bark</td>
<td>Tea decoction Tincture</td>
<td>Traumatic injuries: bruises, sprains, back pain</td>
</tr>
<tr>
<td>Prickly Ash</td>
<td>Zanthoxylum clava-herculis/ Rutaceae</td>
<td>Bark, berries</td>
<td>Tea decoction Tincture</td>
<td>Peripheral neuropathy, nerve pain, sciatica, increases circulation</td>
</tr>
</tbody>
</table>

### Table 6: Antispasmodic Herbs\(^{11-13}\)

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Latin Name/ Plant Family</th>
<th>Plant Part Used</th>
<th>Medicinal Preparations</th>
<th>Specific Pain Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Haw</td>
<td>Viburnum prunifolium/ Caprifoliaceae</td>
<td>Fresh bark</td>
<td>Tea decoction Tincture</td>
<td>Smooth muscle relaxant, dysmenorrhea, ovulatory pain, epididymitis, intercostal pain from cough, abdominal cramps</td>
</tr>
<tr>
<td>Cramp Bark</td>
<td>Viburnum opulus/ Caprifoliaceae</td>
<td>Fresh bark</td>
<td>Tea decoction Tincture Oil (topical)</td>
<td>Menstrual cramps, ovulatory pain, menstrual headaches, low back spasms, Irritable Bowel Syndrome</td>
</tr>
<tr>
<td>Kudzu</td>
<td>Pueraria lobata/ Fabiaceae</td>
<td>Root</td>
<td>Tea decoction Tincture Powder</td>
<td>Torticolis, back spasms, sinus or cluster headaches</td>
</tr>
<tr>
<td>Lobelia</td>
<td>Lobelia inflata/ Campanulaceae</td>
<td>Fresh herb in flower, seed</td>
<td>Tea infusion in flower, Tincture OIl (topical)</td>
<td>Low-dose internally; spasmodytic cough with pain; topical: muscle spasm and tension, back or neck pain</td>
</tr>
<tr>
<td>White Peony</td>
<td>Paeonia lactiflora/ Ranunculaceae</td>
<td>Root</td>
<td>Tea decoction Tincture</td>
<td>Muscle spasms, fibromyalgia, menestral cramps, migraine</td>
</tr>
<tr>
<td>Wild Yam</td>
<td>Dioscorea villosa/ Dioscoriaceae</td>
<td>Rhizome</td>
<td>Tea decoction Tincture</td>
<td>Menstrual cramps, gas pain, sharp constriction abdominal pain, gallbladder spams, inflammatory bowel disease, rheumatoid arthritis, fibromyalgia</td>
</tr>
</tbody>
</table>

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.
References

Featured Educational Opportunity

May 19-21, 2018 Plant-based Prevention Of Disease: the 5th annual national nonprofit P-POD Conference, Raleigh NC. 27 speakers (clinicians, researchers, educators), including 7 RDNs, discuss the latest research on plant-based diets (and allied lifestyle changes) and their effect on prevention and treatment of chronic disease. 17 CPEUs approved for RDNs and NDTRs, and 16.75 ABLM CMEs for Lifestyle Medicine board exams. DIFM members again get 12%-13% discount below lowest professional rate. Early bird prices notch upward on Jan. 11, Mar 8 and Apr 26. More info: www.p-pod.org, http://preventionofdisease.org/speakers-2018/or http://preventionofdisease.org/schedule-2018/, or contact info@p-pod.org.

Three Considerations For Pregnancy

Tarah Allen is currently working towards her Masters of Science in Nutrition and Dietetics at Bastyr University. After graduation she is interested in pursuing a career in integrative and functional medicine, with an emphasis on maternal-infant care and pediatrics. Contact Tarah at tarah.allen@bastyr.edu.


Electronic Mailing List (EML) Recent Topics Review

In recent threads on the DIFM listserv, members discussed various treatments for patients who are group B streptococcus (GBS)–positive during pregnancy. GBS is a gram-positive bacteria that is treated with IV antibiotics during labor before a vaginal birth. Several common recommendations discussed the possibility of treating GBS during pregnancy with probiotics to achieve negative test results before delivery. In particular, members mentioned Lactobacillus rhamnosus (GR-1) and Lactobacillus reuteri (RC-14) strains as being effective in the treatment and prevention of bacterial vaginosis. It was mentioned that there are a few clinical trials underway to study the use of probiotics and its effect on GBS. Other discussion topics included remedies to treat and prevent the flu. Members recommended taking higher doses of vitamin A and vitamin C for a few days to serve as an antiviral in supporting the respiratory tract to resist infection. Herbal recommendations included ginger, licorice root, echinacea, and elderberry. Increasing intake of onion, garlic, celery, and spinach were common culinary suggestions to support the body during illness. In our commitment to being fair and unbiased, rather than identifying individuals, programs, or organizations, discussions regarding certificate programs, testing, and nutrient analysis programs can be found on the listserv under http://groups.yahoo.com/neo/groups/DIFM_Listserv/info.

Recent Topics Review

Julia Whelan is a foodie at heart who also happens to be a dietitian. She believes in food’s natural ability to nourish our bodies and understand, in great depth, how to harness food’s power so we can feel our best.

Follow her on Instagram at @acoupleddietitians.
What’s New - Journal Reviews and Resources

Mind and Body Approaches to Chronic Pain: What the Science Says

The National Center for Complementary and Integrative Health (NCCIH) Clinical Digest, a monthly digital newsletter for health professionals from the NIH, focused its March issue on mind and body approaches to chronic pain. Included is current evidence-based information for meditative movement therapies (tai chi, yoga, qi gong), acupuncture, mindfulness, biofeedback, massage, chiropractic care, and other practices as interventions for the following conditions: fibromyalgia, headache, low-back pain, neck pain, osteoarthritis, and rheumatoid arthritis. Evidence to date is varied, suggesting that some mind-body approaches do show modest benefit while in certain instances the amount of evidence may be too small. The research can be found at this link: https://nccih.nih.gov/health/providers/digest/ChronicPain-mindandbody-science.

Magnesium Supplementation in Vitamin D Deficiency

Both vitamin D and magnesium (Mg) deficiencies continue to be underdiagnosed and may lead to several chronic disease states. In this literature review, researchers investigated replacement therapy and preventative supplementation of vitamin D and Mg. Replacement therapy for both vitamin D and Mg was found to be effective in elderly patients in reducing overall mortality, nonvertebral fractures, and the incidence of Alzheimer’s disease. Vitamin D supplementation has increased worldwide through easily available screening and increased awareness of its many functions. However, despite that increase, it has been found that ~75% of adults worldwide have serum 25(OH)D levels <30 ng/ml, a grossly inadequate level for disease prevention. On the other hand, Mg deficiencies often go unrecognized due to lack of screening tools. Because of magnesium’s role in vitamin D metabolism, adequate Mg supplementation should go hand-in-hand with vitamin D therapy. Further, taking large doses of vitamin D can induce severe depletion of Mg; therefore Mg supplementation should be considered as an important aspect of vitamin D therapy.


Reduction of opioid use and improvement in chronic pain in opioid-experienced patients after topical analgesic treatment: an exploratory analysis

Opioids are used to manage chronic pain in patients. There is a growing need to find alternative approaches to managing pain. This prospective observational study monitored the use of topical analgesics and their effectiveness in managing pain. The investigators’ objective was to reduce the use of opioids to lessen the risk of addiction, misuse, and abuse. Topical analgesic treatments were assessed in two groups of subjects. The first group consisted of 121 patients, and assessments were taken at baseline and 3 months. In the second group, 27 patients completed baseline and 6-month follow-up assessments. After treatment with a topical analgesic, 49% of patients in the 3-month follow-up and 56% in the 6-month follow-up reported that they had discontinued their use of opioids. Another significant finding was that in each group, around 30% of patients discontinued all pain medication. Concurrently, it was also reported that medication use decreased by 65% after 3 months and 74% after 6 months. The study found statistically significant decreases in pain severity in both the 3-month group and the 6-month group. Topical analgesics were reported in both groups to be an effective and safe alternative for treating chronic pain. The authors concluded that while these findings are significant and present a hopeful alternative to opioid use, further randomized controlled trials are needed to confirm their findings.


Hot Nutritional Genomics Topics


Summary of the 11th ISNN Congress (past program can still be found at https://isnn2017.org/). The 12th Congress is being planned for this Sept 30 – Oct 3 in Winnipeg, Manitoba, Canada. See http://www.isnn2018.org for details.


A number of gene variants significantly associated with the risk of gestational diabetes are described, which the authors

Advances in understanding how nutrition can be personalized to help prevent coronary heart disease and myocardial infarctions are described, e.g., the Mediterranean diet, the effects of various dietary fats, or dietary proteins, caffeine, alcohol, electrolytes, dietary minerals, and more.


The response to antioxidants and zinc supplementation among those at risk of age-related macular degeneration was found to be influenced by genetic variants in the CFH and ARMS2 genes.


Foodomics can be helpful in describing and explaining how foods, functional foods and nutraceuticals, together with bioinformatics and systems biology can help translate emerging research into practical applications.


Thirty-seven courses in nutritional genomics of various types in multiple countries are described in Table 2, which include some university degrees or courses, plus workshops or presentations, with most offering online content. Not intended to be an exhaustive listing, but indicative of what was found during online searching that might be useful for professional development within the field of nutritional genomics, without assessment of their relative merits.


Table 1 provides a listing of CDC activities and publications since 1997 which further Public Health Genomics. This review of CDC efforts over the years concludes by suggesting that there is an evidence-based way to move forward with genomics-based health care in a practical way, including for prevention. This requires a combination of approaches which includes education, while also making an effort to avoid health disparities.


The amount of genetics education of dietitians was found to be low, so a standard curriculum in genetics education for registered dietitians is recommended.


Concise review of gene-nutrition/environment interactions which can be useful for targeted prevention/interventions.


More than 9000 participants from 9 European countries were surveyed with questionnaires about their intentions and attitudes, including trust levels for various information sources pertaining to personalized nutrition. Responses varied considerably between regions, with a number of interesting findings that the authors feel can be useful in encouraging broader acceptance of personalized nutrition-related services.

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Chronic pain, now considered a disease in and of itself, is an epidemic in the United States, affecting more people than diabetes, heart disease, and cancer combined. Despite the necessity of conventional therapies—pharmacotherapy, injections, and surgery—there is no evidence that these treatments have decreased the incidence or prevalence of chronic pain and lamentably, has left us with a well-publicized opioid crisis. Dr John Sarno, who passed away in 2017 a few days before his 94th birthday, predicted this epidemic in the United States, affecting more people than diabetes, heart disease, and cancer combined. Despite the necessity of conventional therapies—pharmacotherapy, injections, and surgery—there is no evidence that these treatments have decreased the incidence or prevalence of chronic pain and lamentably, has left us with a well-publicized opioid crisis.

In Sarno’s view, mindbody medicine refers to physical disorders of the mindbody, or disorders that may appear to be purely physical but originate in unconscious emotions. In his books, he uses the terms “mindbody” and “psychosomatic” interchangeably. Psychosomatic translates to “mind body,” but he recognized that although psychosomatic was accepted in the first half of the 20th century, the medical establishment essentially banished it from literature in the second half due to its negative connotation and the mistaken belief that it meant symptoms were imaginary or invented for personal gain. Although we see many variations of the word, Sarno uses mindbody as one word, which will be used throughout this article.

In his earlier books, he called all of these pain disorders “Tension Myositis Syndrome (TMS),” myositis meaning physiologic alteration of muscles. TMS is a painful but harmless change of state in muscles. Later he would have rather called it “musculoskeletal mindbody syndrome” a more descriptive term to account for the involvement of nerves and tendons, but he didn’t want to confuse people with the change in terms. Sarno’s theory is that in TMS and other pain disorders, the brain triggers a reduction of blood flow to a specific part of the body thereby causing oxygen deprivation which causes pain and other symptoms, depending on which tissues have been oxygen-deprived. The goal of the unconscious part of the brain is to deliberately distract the conscious mind. It is essentially a defense mechanism or a protective maneuver to divert attention to the body in order to avoid the awareness or confrontation of certain repressed emotions that are a result of being human. Biochemically this is oxygen deprivation; energetically, it is blocked, stuck, or stored emotions. The location or symptom is not important as long as it fulfills its diversionary goal. At times, if said pain is corrected with, for example, surgery, the psyche may find another symptom to take its place; and the process continues resulting in more pain, expense, economic, personal, and familial distress. Importantly, serious physiological disease is always initially ruled out. The brain induces these symptoms via the autonomic nervous system or, as he calls it, autonomic “peptide” system. In The Divided Mind, Sarno widened his umbrella from TMS to include other familiar pain disorders from reflux, irritable bowel syndrome, and migraines to carpal tunnel syndrome, fibromyalgia, and widespread chronic pain. Sarno states that these illnesses can be completely of mindbody origin or have a mindbody component. The key to the elimination of pain is first, the patient’s acknowledgement and understanding of the anatomy, physiology, and psychology of the disorder and how their own life histories and issues, personalities, and unconscious dynamics are related. Secondly, there has to be more than just the blind faith of a placebo, but acceptance of the process and diagnosis; for denial is one of the psyche’s strategies for keeping the pain going. In fact, many readers have written letters stating that they “cured themselves” just by reading his books; the knowledge and acceptance of what was happening destroyed the brain’s strategy. Sarno did not automatically select every patient into his program; not everyone was willing to accept a mindbody diagnosis that was essential for success. For many sufferers, it is not only difficult to grasp that their condition may be of mindbody origin, but they have to be courageously willing...
to look at their most difficult feelings of anger, rage, fear, regret, despair, perfectionism, childhood trauma, and life stresses in order to learn the language between mind and body, conscious and unconscious. After an in-depth initial consultation and a thorough history and physical exam, patients begin treatment with a group lecture on first, the anatomy and physiology of their condition and then a detailed investigation of psychology and the unconscious. They were then given a study program and told to report back with progress or lack thereof in several weeks. Notably, there were patients with and without actual tissue damage. Damage is not an indication of pain, as there are many patients with injury who are asymptomatic.4 Many incorrectly assumed that his theories meant “it’s all in your mind,” implying that the symptoms are part of the patient’s imagination. However, Sarno adamantly called that insulting, insisting that symptoms are not signs of a mental or emotional illness but the result of a real physical process. Nor is it the result of secondary gain, an unconscious wish for benefit from the symptom such as sympathy, support, release from responsibility, labor, monetary gain, etc. The medical community has not necessarily embraced Sarno’s theories—he would often be found eating lunch alone at NYU and was not invited to present at monthly department meetings. However, recognition of his work has grown steadily over the last 30 years, especially in light of the increasing lack of evidence for conventional diagnoses and treatments and the millions currently suffering from chronic pain. Studying mindbody disorders does not lend itself well to formal scientific laboratory studies. Identifying and measuring individual unconscious emotions would be a considerable challenge and would take him away from the clinical work he preferred. In the best-selling book, *Crooked: Outwitting the Back Pain Industry and Getting on the Road to Recovery* by Cathryn Jakobson Ramin, Sarno was called the “rock star of the back world,” he is the subject of a 2004 film called *All the Rage*, and has a filled testimony page called [www.thankyouodrsarno.com](http://www.thankyouodrsarno.com).

In 1982, protégé Dr Daniel Schechter conducted Sarno’s first follow-up survey by developing a questionnaire to assess pain levels and response to treatment. He randomly telephoned 177 patients, analyzed the data, and determined that Sarno had a 77% success rate.

While still controversial, the International Association of Pain (IASP) defined pain in 1974 as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage.”5 Despite including an “emotional experience” as part of their definition, this aspect of pain has been overlooked in the linear medical model yet begs for further investigation in the healing process. As emotional experiences may be our most individual human characteristic, it is in the best interest of the chronic pain patient for clinicians to collaborate and investigate all possible avenues—mind, body, and spirit. To the uninitiated, the relationship of mind to body may be mysterious, but Sarno believed it is no less mysterious than the relationship of the heart to the circulation of the blood. Currently, chronic pain patients are some of the most feared by clinicians as pain is the symptom most likely to create feelings of helplessness for the healer.6 However, if patient and clinician can learn and embrace the language of mindbody awareness, knowledge, and practice, then a potential missing piece may be found in the quest for relief.

### References


The Pilates Method and Chronic Low Back Pain

Holly A Van Poots, RDN, CSP, FAND

According to the 2012 National Health Interview Survey (NHIS) conducted by the National Center for Health Statistics, approximately 25 million adults live with daily pain. This survey also found that severity of pain was associated with worse health outcomes, increased use of health care, and higher levels of disability. Chronic pain sufferers often seek complementary health approaches to manage symptoms and improve quality of life. In fact, back pain, neck pain, and joint pain account for the top three conditions for which complementary health approaches, such as natural products and/or mind and body practices, are frequently used among adults. Mind and body practices include a range of modalities such as acupuncture, breathing practices, craniosacral therapy, healing touch, hypnosis, massage therapy, mediation, Pilates, Qi gong, reflexology, Reiki, Tai Chi, and yoga among others. This article presents evidence for the effectiveness of Pilates exercise programs for the management of chronic pain, and specifically chronic low back pain. The Pilates method is a system of exercise centered around awareness of the breath and precise control of movements which is used to strengthen and build control of postural and core muscles. Originally called “Contrology” by the method’s founder, Joseph Hubertus Pilates, Pilates began using his techniques for the purpose of rehabilitation while held at a British internment camp during World War I. After immigrating to the United States, he and his wife opened the first Pilates studio in New York City in the 1926. The Pilates method was used by dancers, gymnasts, and circus performers as well as the elite of New York society for many years prior to becoming a mainstream form of exercise. Pilates published two books—Your Health in 1934 and Return to Life Through Contrology in 1945—in which he described his philosophies on achieving health and wellness through a balanced body, mind, and spirit. He believed that lifestyle, poor posture, and inefficient breathing all upset the balance of the body resulting in poor health. Undoubtedly, Joseph Pilates was years ahead of his time. Throughout the course of his career, he developed over 600 exercises as well as several pieces of apparatus. In addition to mat-based exercise, the most popular apparatus used today for Pilates exercises include the Cadillac or trapeze table, the Reformer, the Chair, and the Ladder Barrel (see Figures 1-3). A 2016 survey of Pilates clients in the United States found that more strength, improved health, more mobility, physical therapy, injury prevention, and medical conditions were among the reasons respondents cited for starting Pilates. In addition, 12% of the 1032 clients surveyed began practicing Pilates at the recommendation of a medical professional. A PubMed search using the terms “Pilates” and “pain” yields 114 results with 80 of these published during the last 5 years. Back pain is the most frequently studied medical condition among these articles, appearing in 67% of results. Chronic pain appears in 59% of results. One recently published systematic literature review examined 23 studies published from 2005-2016 for effectiveness of Pilates as a rehabilitation tool for low back pain, ankylosing spondylitis, multiple sclerosis, postmenopausal osteoporosis, nonstructural scoliosis, hypertension, and chronic neck pain. Of the 23 papers, 19 found Pilates to be more effective than the control treatment for improving pain and disability levels. Investigators acknowledged the efficacy of Pilates interventions in recent clinical trials and called for future research into the benefits of specific Pilates exercises for specific conditions.
were significantly less for the equipment-based group. Between intervention groups, no differences were observed in pain intensity or perceived effect; however, it should be noted that within groups, pain improved significantly with treatment at both 6 weeks and 6 months. A more recent study compared the effectiveness of a 12-week mat-based or equipment-based Pilates intervention for patients with chronic low back pain. This randomized controlled study also assessed disability, kinesiophobia, and transverse abdominis activation in addition to pain. Improvements were observed for all variables in both groups at 6 and 12 weeks, but the participants using Pilates apparatus noted faster improvements.

A third study comparing mat versus equipment exercises evaluated 40 women in their 30s with low back pain. Both groups performed prescribed exercises 3 days per week for 8 weeks; and although improvements were observed in both groups, investigators found mat-based exercises to be more effective for improvement in objective measures of balance and pain. Authors attributed these results to use of body weight to improve core strength in mat-based exercises. It should be noted, however, that it was not clear from the description of study methods whether the participants in either group were supervised by trained instructors or performed the prescribed exercises independently. The prescribed exercise programs were listed, but no indication of whether the programs were progressed over the course of the study or adapted according to participant needs was given.

Although unrelated to pain, a 2018 study evaluated a 16-week mat-based Pilates program for health perception and sleep quality in women ages 60 or older and found that both perceived health status and sleep quality were significantly improved. Supervised exercises were performed twice weekly and progressed after two weeks by the addition of intermediate exercises. In addition to sleep quality measures, use of sleep medication decreased by experimental group participants compared with controls, and depression subscales also improved. Investigators suggested future research assessing the effectiveness of apparatus-based exercises on the same outcome variables. Integrative nutrition practitioners often address the impact of sleep hygiene and mental health on wellness, and self-care interventions which support improved health perceptions are an important part of an integrative nutrition toolbox.

Medication side effects and drug-nutrient interactions are also part of a complete nutrition assessment, and reducing use of pharmaceuticals may be a desired outcome for some clients or patients. A 2015 randomized controlled trial evaluated the impact of medication plus a Pilates intervention on measures of pain, function, quality of life, satisfaction with treatment, flexibility, and nonsteroidal anti-inflammatory drug (NSAID) intake at 1.5, 3, and 6 months. Investigators concluded that Pilates exercises were effective in reducing pain, improving function, and increasing quality of life indices of functional capacity, pain, and vitality without negative effects on the participants. In addition, study participants in the experimental group used fewer NSAIDs than the control group at all time intervals.

The body of literature surrounding Pilates and pain continues to expand rapidly with studies published over the past approximately 18 months showing positive outcomes from Pilates interventions on forward head posture; health-related quality of life in women with chronic low back pain; pain and general health indices among men with chronic low back pain; pain and disability in patients with knee osteoarthritis; disability and pain among individuals with mild-to-moderate chronic neck pain; pain, disability, depression, quality of life, and thickness of neck muscles in patients with chronic neck pain; pain during pregnancy, including during the third trimester; shoulder pain; pain, muscle strength, and functional status for upper extremity disorders resulting from breast cancer treatment; improved quality of life, pain, functional ability, and range of motion in juvenile idiopathic arthritis; pain, anxiety, and quality of life in females with fibromyalgia; and pain, functional status, quality of life, and kinesiophobia in osteoporosis patients.

Joseph Pilates once said, “Change happens through movement and movement heals.” The Pilates method has indeed proven to be a successful rehabilitative strategy in numerous settings. For example, Core Compassion Project is a North Carolina–based nonprofit organization which provides scholarships for private Pilates training to breast cancer survivors. Approved instructors create individualized programs specific to the scholarship recipients’ needs with a focus on quality of movement rather than quantity in an effort to improve strength and mobility and facilitate healing both physically and mentally. Fatigue, both during and after cancer treatment, is a significant barrier for those transitioning from treatment to posttreatment daily life, and Pilates has been an effective way to ease cancer survivors into the transition.

In summary, integrative registered dietitian nutritionists (RDNs) working with clients who are seeking to manage chronic pain are in a perfect position to suggest complementary health approaches such as Pilates which have been proven to decrease pain and disability, improve functionality, and improve quality of life. Collaboration with trained Pilates instructors can be a
valuable part of the integrative RDNs referral network and can add significant benefits for clients. Certified Pilates Teachers through the Pilates Method Alliance can be located through a directory search available at www.pilatesmethodalliance.org. For individuals with lack of access to studios, schedule conflicts, or financial constraints, a variety of online Pilates classes for all levels can be accessed through www.pilatesanytime.com.

**Figure 1. Kneeling lunge stretch performed on the Pilates Reformer**

**Figure 2. Abdominal work performed on the Pilates Reformer**

**Figure 3. Mixed apparatus group class using Ladder Barrel (left), Wunda Chair (back center), Cadillac (back right), and Step Barrel (front)**

Photos by Rebekah Budnikas, used with permission
References


Hyperuricemia and Related Painful Diseases

Ruixue Hou, MS, and V Saroja Voruganti, PhD

Introduction

Uric acid is the end product of purine metabolism in humans. Purines are molecular components of DNA, RNA, and several other important biomolecules. At optimal levels, uric acid seems to have a positive role as an antioxidant; however, at elevated levels it causes gout and nephrolithiasis and also increases the risk for hypertension, metabolic syndrome, type 2 diabetes, cardiovascular disease (CVD), and chronic kidney disease (CKD).1,2 Hyperuricemia has also been found in conditions such as osteoarthritis and rheumatoid arthritis1,4 and is thought to increase inflammation and pain due to the deposition of urate crystals.3 This review summarizes the role of hyperuricemia in the risk and management of these painful crystal-related diseases.

Hyperuricemia

Hyperuricemia is defined as an SUA concentration greater than 7 mg/dl in men and 6 mg/dl in women.1 The prevalence of hyperuricemia in the United States (US) has increased considerably in the past few decades, with an approximate 21% of individuals (43 million) affected in 2007.5 Uric acid is the end product of purine metabolism whereby purine nucleotides are metabolized to xanthine and uric acid via the enzymatic action of xanthine oxidase. Most mammals have the enzyme uricase, which further degrades uric acid into allantoin and other compounds that can be easily excreted by the kidneys. However, humans lack uricase, and thus are not able to metabolize uric acid. Most of the uric acid produced by our body is reabsorbed by the kidneys and not excreted. Only about 10% of the uric acid produced is ultimately excreted, with two-thirds of it being excreted by the kidneys, and one-third by the intestinal tract.1,2

Uric acid production and excretion regulate SUA concentrations.6,8 Increased uric acid production is caused by high purine intake, high cell turnover, and some medications. Decreased uric acid excretion can be caused by impaired renal function, resulting in hyperuricemia and increased urinary uric acid (hyperuricosuria), which are associated with gout and kidney stones respectively.8,9

There is strong evidence that genetic factors play a key role in the regulation of SUA.10-15 Several genetic studies, including studies by Voruganti lab in American Indians, Mexican Americans, and Alaskans, have shown SUA to be significantly heritable.11-15 Genetic studies have also shown strong associations between SUA and uric acid transporter variants, prominent among them being solute carrier family 2, member 9 (SLC2A9).16-21 Other transporters that have been associated with SUA include solute carrier family 22, members 11 and 12 (SLC22A11 and SLC22A12); ATP-binding cassette, subfamily G, member 2 (ABCG2); solute carrier family 17, members 1, 3, and 4 (SLC17A1, SLC17A3, and SLC17A4); and solute carrier family 16, member 9 (SLC16A9).16-18 These transporters play a significant role in the reabsorption and excretion of uric acid in the proximal tubules of the kidney.16-21

Hyperuricemia is a causal factor for gout and kidney stones

Hyperuricemia is a causal factor for gout and kidney stones. Gout is a painful disease caused by the formation of monosodium urate crystals in joints and other tissues.22 Gout is a type of arthritis, and the elevated serum urate concentration is strongly influenced by genetic and nutritional factors.10,22 It is an inflammatory condition where the initial episodes or flares are sporadic and short (3-5 days) followed by long pain-free periods. However, as the disease progresses untreated, the painful episodes become more frequent and prolonged. Chronic gout develops when the tophi (masses of uric acid crystals) become visible and joint damage occurs, thereby affecting the individual's mobility and quality of life.1,22,23

The prevalence of gout has been increasing worldwide, especially in developed countries. In 2007, the prevalence of gout was about 3.9% in the adult population (age >20 years).3 Gout is associated with considerable medical costs, is usually accompanied by comorbidities,
and impairs quality of life. The annual cost of care for a gout patient is approximately 3000 dollars more than for a patient who is not suffering from gout.24,25 It has been reported that in individuals with gout, 74% had hypertension, 71% had CKD, 24% had nephrolithiasis, 14% had myocardial infarction, and 10% had suffered a stroke.26 Despite its increasing prevalence and associated comorbidities, gout is often mismanaged and not adequately treated.

SUA concentration is a function of an individual’s exposure to internal factors (eg, age, sex, BMI, diabetes status, hypertension status, menopause status, etc) and external factors (eg, nutrient intake, alcohol intake, smoking, and medications). Gout management usually starts with dietary modification as dietary intake is known to play a major role in the maintenance of normal uric acid levels in blood. A diet containing predominantly purine-rich foods, as well as alcohol consumption—specifically beer—are believed to increase SUA levels.27 Purine-rich foods include asparagus, spinach, peas, cauliflower, mushrooms, organ and glandular meats, and selected seafood items such as anchovies, herring, sardines, mussels, scallops, mackerel, and tuna. In addition, increased fructose intake may contribute to hyperuricemia by providing extra adenosine monophosphate (AMP) molecules for uric acid production.28 High vitamin C intake, on the other hand, increases urinary uric acid excretion, and thus has a uricosuric effect resulting in reduced SUA levels. Some research suggests that moderate coffee consumption may be beneficial for gout; but considering the effects of coffee on other metabolic conditions, it is not clear if coffee can be made part of the treatment regimen.29

Pharmacological treatment of gout usually starts with medications such as nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroids, and colchicine as first options.30-32 Those who have progressed to severe or recurrent attacks are prescribed drugs such as xanthine oxidase inhibitors (allopurinol, febuxostat) or those drugs that increase urinary excretion of uric acid (probenecid, lesinurad).30 However, it is necessary to check for side effects or sensitivity to allopurinol and febuxostat, which can include rashes, nausea, and altered liver function. Treatments should always accompany patient education and counseling and regular follow-up with laboratory analysis of blood biomarkers.31-32 Various factors—including genetics—play important roles in the development, progression, and management of gout. Studies have shown that men, African Americans, and individuals who are obese and/or have a family history of gout are at a higher risk.33 Studies from Voruganti lab have reported that individuals with specific variants in SLC2A9 and ABCG2 genes had lower SUA concentrations,19-21 Genetic factors also play a role in identifying those who are sensitive to the side effects of allopurinol. The presence of HLA-B*5801 allele seems to put individuals at high risk for allopurinol hypersensitivity syndrome.34 Therefore, consideration of demographic and genetic factors could be beneficial for the appropriate management of hyperuricemia and gout.

When hyperuricemia is combined with hyperuricosuria (high urinary uric acid), it is associated with kidney stones.35,36 From 2007-2010 in the US, the prevalence of kidney stones was 8.8%, with higher levels in men (10.6%) than women (7.1%).37 Kidney stones composed of uric acid account for about 10% of all kidney stone cases; however, uricosuria is also a contributing factor in stones composed of calcium oxalate.38 Uric acid stones are usually formed in individuals with hyperuricosuria, and 15-20% of patients with uric acid stones have a history of gout.37 As with gout, a diet rich in purines and foods that cause dehydration increases the risk for uric acid stone formation.37 Urinary pH is also a variable in kidney stones, as low pH (<5.5) can cause uric acid to saturate and crystallize, leading to stone formation.38,39 The main target of kidney stone treatment is to increase the solubility of uric acid in urine, which can be achieved by increasing the alkalinity and volume of the urine.

**Hyperuricemia is associated with osteoarthritis and rheumatoid arthritis**

Osteoarthritis (OA) is a chronic degenerative joint disease characterized by degradation of the cartilage between the joints.41 The condition can be the result of normal wear and tear and leads to pain, stiffness, and swelling at the joints. The link between hyperuricemia and OA has long been recognized.3 Aging and obesity are risk factors for both OA and hyperuricemia. The monosodium urate crystals formed as a result of SUA saturation promote cartilage degradation, thus increasing the risk of OA.42 Several studies have reported hyperuricemia in OA patients.3,41 Although many drugs have been approved for reducing pain in OA, none of these stop its progression. Thus, reduction in SUA may be an alternate therapy for stopping the progression of OA. For example, colchicine, a gout medication, has been shown to reduce the pain in OA.43 Rheumatoid arthritis (RA) is an autoimmune disease in which the body’s immune system attacks its own joints.4,44 This causes inflammation and causes the synovium (the lubricating connective tissue in the joint) to thicken, resulting in pain in and around the joints. If not controlled, it can damage cartilage and the bone itself.44 RA commonly affects joints of the hands, feet, wrists, elbows, knees, and ankles. Although the relationship between hyperuricemia and RA is not well characterized, the role of monosodium urate crystals in causing damage to joints is increasingly recognized.4,45 Therefore a reduction in serum uric acid may be a potential therapeutic target.36

**Take-Home Message**

The prevalence of hyperuricemia and gout is increasing, and proper medical management is needed. Reducing SUA concentrations is a key target for treating gout...
and kidney stones and may also help in reducing urate-related inflammation in osteoarthritis and rheumatoid arthritis. Diet should be the first-line therapy for reducing SUA, followed by pharmacological therapies. For dietitians treating patients with elevated SUA, it is important to limit purine-rich foods and fructose while ensuring adequate hydration.

As mentioned, family history and genetic susceptibility play an important role in the incidence and progression of hyperuricemia and related diseases. For example, T allele of rs734553 of ABCG2 and rs2231142 of SLC2A9 are associated with increased SUA concentrations. Knowledge of genotype could help to identify individuals at risk long before the disease onset, especially when we take into account a combination of uric acid–associated variants. Nutrigenetic studies related to the influence of genetic variants on diet response are paving the way for the era of precision nutrition. However, more research is needed before the results can be translated into dietary advice, as many of the statistically significant associations are based on small sample sizes, and replication is needed for most findings. Therefore, management of these painful diseases requires a treatment plan that combines diet modifications and drugs (as needed), takes into account genetic background, and utilizes education, counseling, and monitoring.

References

31. Nuki G, Doherty M, Richette P. Current management of gout:


A Nutritional Approach to Cognitive Decline

This article was written to fulfill requirements for receipt of 2018 DIFM Student Educational Stipend, for attendance at the Integrative Health Symposium in New York on February 24, 2018. Tammy Jordan is a second-year graduate student in the Master of Science Nutrition program at Hunter College in New York. She is looking forward to completing her dietetic internship and is interested in the relationship between nutrition and health, particularly infertility, pregnancy, and during the postmenopausal period. Tammy was the recipient of the 2018 DIFM Student Educational Stipend, which gave her the opportunity to attend the Integrative Health Symposium in New York on February 24, 2018. Contact Tammy at tamsinjordan1@gmail.com or find her on Instagram: @jordan_nutrition.

Many experience some degree of cognitive decline as part of the natural aging process; however, for some, the decline is exacerbated and results in severe cognitive impairment that interferes with everyday life. Dementia is the general term given to this rapid decline in mental condition and encompasses a wide range of symptoms. At least two of the following mental faculties must be severely impaired to receive a diagnosis: (1) memory, (2) communication and language, (3) ability to focus and pay attention, (4) reasoning and judgment, and (5) visual perception. The most common type of dementia is Alzheimer’s disease (AD), with the late-onset subtype accounting for 90% of cases, and is underpinned by physical changes in the brain that can start decades before the onset of symptoms. While there is still no cure for AD, first-line treatment currently involves a monotherapeutic approach with pharmaceuticals. As the rate of AD continues to rise, however, researchers are beginning to investigate alternative treatment options, particularly focused on functional nutrition, to alleviate symptoms and improve quality of life for patients.

At the 2018 Integrative Healthcare Symposium, two presenters spoke about their work in the field of cognitive decline. Mark Menolascino, MD, MS, ABIHM, ABAARM, IFMCP, from the Meno Clinic Center for Functional Medicine in Jackson Hole, Wyoming, spoke about a functional medicine approach to reversal of cognitive decline; and Laura Rokosz, PhD, owner of EGGLRock Nutrition in Union, New Jersey, spoke about dietary needs of the cognitively impaired. While they each focused on different targets for treatment, they were both united in their opinion that cognitive decline, specifically AD, is a multifaceted condition that requires an integrative, personalized approach throughout the life cycle.

Increasing data suggest that a number of metabolic abnormalities may play an important role in the development of the condition including chronic inflammation, metabolic syndrome, and dysfunction in the gut microbiome among others. Despite these findings, patients with cognitive decline rarely undergo any metabolic or genomic evaluations, including nutritional status or gastrointestinal permeability testing.

**Chronic Inflammation**

While immediate and short-term inflammatory responses in the body are vital to address infections and trauma, chronic inflammation has been linked to cardiovascular disease, diabetes, autoimmune disease, cancer, and AD. Dr Menolascino elaborated on the link between AD and chronic inflammation by describing the immune response as one of three major pathologies associated with the condition, the others being senile plaques, comprised of beta-amyloid peptides, and neurofibrillary tangles. Soluble beta-amyloid peptides are present in healthy brains and increase during the normal aging process; however, in AD, these peptides undergo a conformational change which causes them to become insoluble and deposit in the parenchyma. Over time, these peptides become compacted into amorphous plaques and then progress further into senile plaques which contain peptides that are fibrillar in nature and release neurotoxins. It is believed that the release of these neurotoxins is the primary cause for AD pathology resulting in neuron death.

Microglia are a type of cell distributed throughout the brain, central nervous system (CNS), and spinal cord. These cells exhibit macrophage-like properties and are the primary responders to injury, releasing acute phase proteins and cytokines, including interleukin-1 beta (IL-1β) and tumor necrosis factor alpha (TNF-α). Microglia associated with AD have been found to have an increased expression of inflammatory markers and receptors for cytokines and inflammatory agents. The role of inflammation in AD has been bolstered by research that showed that patients with arthritis who were treated with nonsteroidal anti-inflammatory drugs (NSAIDs) had a reduced incidence of AD. Dr Menolascino highlighted the importance of targeting the innate rather than adaptive immune system to combat systemic inflammation. Consumption of omega-3 fatty acids can help to mediate the immune response by stimulating macrophages in AD patients to resume normal phagocytic function and protect homeostasis in the brain. Similarly, there are indications that consumption of fatty acids in fish at least once per week can also be protective against the development of AD.

In addition to inflammatory-based cognitive decline, Dr Menolascino suggests that the condition can be further categorized as noninflammatory and cortical. These subtypes are based on work by Bredesen who evaluated metabolic parameters in patients with cognitive decline. Bredesen found that some patients exhibited cognitive decline that did not indicate excess inflammation and was...
more likely associated with insulin resistance, hypovitaminosis D, hyperhomocysteinemia, or hormonal loss associated with early oophorectomy. This subtype tends to have reduced or absent signs of systemic inflammation, such as elevated high sensitivity C-reactive protein (hs-CRP), reduced albumin to globulin ratio, and high interleukin-6. The cortical subtype is characterized by an MRI showing general cortical atrophy, rather than hippocampal atrophy. Patients with this subtype were more likely to lack a family history of cognitive decline, were APOE-E4-negative, typically had an earlier age of onset in the fifth to seventh decade, and demonstrated low zinc status. This research indicates that there may be benefits to performing more detailed metabolic and genomic testing in patients who present with cognitive decline, in addition to MRIs, during the diagnostic phase to ensure subsequent treatment is personalized.

**Neuronal Insulin Signaling**

Research indicates that AD demonstrates metabolic dysregulation similar to that seen in type 1 and 2 diabetes, specifically involving brain insulin resistance and deficiency. As with other metabolic diseases, AD demonstrates impairments in glucose utilization, which can lead to oxidative stress and further inflammation, neuronal loss, synaptic disconnection, and amyloid-beta accumulation. Inflammation in the brain has been specifically linked to abnormal neuronal insulin signaling in AD patients. Research indicates that there is a high concentration of insulin receptors in those brain areas that are susceptible to neurodegeneration including the medial temporal lobe and prefrontal cortex—regions mediating long-term memory and working memory. The proposal that metabolic disease and AD share common inflammatory pathways is supported by studies that indicate patients with type 2 diabetes are at an increased risk of developing AD. Dr Menolascino suggests that incorporating large amounts of polyphenol-containing fruits and vegetables, in addition to omega-3 fatty acids, can improve metabolic functioning and quell brain inflammation, lowering the risk of cognitive decline through neuronal signaling effects and anti-inflammatory actions.

**Ketogenic Approach**

While ketogenic diets have been traditionally prescribed for drug-resistant epilepsy patients in clinical settings, there are now indications that ketone bodies may be beneficial for reducing cognitive decline and providing symptom alleviation in AD. This action is thought to occur through protection against neuronal insults, enhancing neuronal energy reserves, and lowering inflammation. Research indicates that there is a decrease in the brain's ability to utilize glucose in AD patients and that ketone bodies may be an effective alternative. High fat (80-90%), low carbohydrate and protein diet, lowers available glucose in the body, leaving fatty acids as the primary energy source for cells. Ketone bodies derived from this energy source are converted into β-hydroxybutyrate, acetoacetate, and acetone which can easily pass through the brain-blood barrier. Some studies have found that administration of medium chain triglycerides (MCTs), a type of saturated fat, can improve memory performance in AD patients. This improvement was positively correlated with plasma levels of β-hydroxybutyrate produced by the oxidation of MCT. Conversely, AD patients who consume a high carbohydrate diet have been found to have worsening cognitive performance.

**Gut Microbiome**

The gut microbiome includes a diverse community of bacteria that impacts human health in many ways. These microbes aid digestion and nutrient absorption, play a key role in immunity, and are largely responsible for the production of hormones and neurotransmitters that regulate brain function. Dr Rokosz summarized the growing body of research on how the microbiome could play a central role in the pathogenesis of a host of psychiatric disorders via intestinal dysbiosis and increased gut permeability. When the gut is poorly colonized, either with low numbers or with pathogenic bacteria, communication between the gut and the brain may be compromised. This condition, referred to as gut dysbiosis, appears to be tied to multiple cognitive disorders including AD, depression, and anxiety, along with autism spectrum disorders. Studies with germ-free mice subsequently corroborated with human observations, suggest that early colonization of the gut at birth is critical to the development of the hypothalamic-pituitary-adrenal (HPA) axis which drives the production of stress hormones. Poor regulation of the HPA axis is associated with reduced socialization and increased social cognition deficits. Reductions in both microbial number and diversity are seen in elderly populations. Probiotic supplementation reduces anxiety and depression among these patients. An additional role of the gut microbiome is to support the integrity of the digestive tract. It is thought that gut dysbiosis is responsible for leaky gut, a condition often seen in elderly patients. Breaches of the digestive tract facilitate systemic inflammation via activation of Toll-Like Receptors such as TLR4. Chronic stress and inflammation can lead to overactivation of the HPA axis leading to the release of various stress hormones. The close connection between the gut and cognition is supported by research that found 80% of Parkinson's disease patients were found to have gastrointestinal dysfunction and that gut dysbiosis is also strongly associated with schizophrenia. While there is clarity around specific nutrients needed for optimal brain health, it is still unclear which types of probiotics could be beneficial for different neurological deficiency conditions. It is known, however, that beneficial bacteria are not supported by diets high in added sugars, refined carbohydrates, and processed foods.
in processed grains, sugar, or artificial additives. Fermentable foods such as prebiotic fibers and resistant starch should be combined with probiotics to support a state of “eubiosis” or a healthy gut.25,26

**Take-Home Messages**

- The prevalence of cognitive decline is increasing due to an aging population, with women disproportionately affected both as patients and caregivers.27,28
- Research to date suggests that monotherapies for the treatment of AD have been largely ineffective at alleviating symptoms and improving quality of life for patients.
- Research suggests that nutritional therapies could help reduce the incidence and severity of the condition by reducing systemic inflammation, increasing glucose utilization in the brain, and improving diversity in the gut microbiome.

**References**

8. Walker DG. Inflammatory markers...
It was May 2003, and my Dad had just had the lower halves of both his legs amputated after being struck with a rare bacterial infection that also damaged large patches of skin all over his body. To say he was in pain is as much of an understatement as calling someone a “little bit pregnant.” These were pre-dietitian days for me, but I had gone on enough yoga retreats to have an inkling there may be a mind-body connection which could serve as a supplemental pain treatment beyond his cocktail of opioids that kept his eyes as glazed as donuts and had him periodically mistaking me for someone he knew from the Army named “Madge.” I found a book on pain management and brought it with me to the hospital, tagged and underlined with advice I thought might be helpful. “Breathe through the sensations,” it read. “Visualize a garden of daffodils, perhaps, or a sunset, and focus on that image as you inhale deeply and allow your thoughts to transport you out of your body and into a place where you feel no pain.” I squeezed his skinny hand as I read, breathing with him, hoping to miraculously transfer my strength into his withered frame. I remember a smile (or a grimace, perhaps?) forming on his face as we both tried to turn his hospital bed into a sea of roses and the grey buildings outside his window on East End Avenue into a colorful twilight. Did it work? Who knows? But it was a moment of distraction from the endless beeping of his heart monitor and the scent of Ensure in his feeding tube.

Pain is a hot topic, particularly with the current opioid crisis, and having tools in our tool chest to help our patients manage this condition—whether acute or chronic—is paramount to our success as practitioners. I know you’ll find the content within this issue to be helpful and applicable.

As my position as Chair of DIFM winds down, I look back at the many accomplishments DIFM has had over the past 12 months: webinars galore; social media campaigns; dynamite newsletters; an increase in both diverse and student members; an uptick in our involvement in food-related public policy; the introduction of our long-awaited research tool (and its acceptance as a session at FNCE® 2018); the newly released updated module in our Certificate of Training in Integrative and Functional Nutrition, renamed “Environmental Toxins, Exposure, and Elimination;” new partnerships with other DPG groups; and so much more. We are now at 5180 members, our highest number yet. It has been an absolute honor serving as your chair. Not only has it afforded me an amazing opportunity to grow my leadership skills, but it has enabled me to be a stronger voice for change and to connect and partner with numerous leaders both in and outside the dietetics field. If you haven’t considered taking on a leadership role or just becoming more involved in a DPG or a local chapter, I encourage you to do so. No matter what, your voice matters—so stay active and involved, and continue to be the change you want to see. Be sure to join us for what promises to be another banner year with DIFM in 2018-2019. While I may not be at the helm, I join you in our persistent efforts to grow, expand, and continue to touch and positively affect, not only the lives of our patients, but those in our dietitian community.

Warmly,
Mary Purdy, MS, RDN
As my tenure as Newsletter Editor for Nutrition in Complementary Care, now Dietitians in Integrative and Functional Medicine (DIFM), winds down, I think back over the past 17 years and how much has changed. Packing up 17 years of newsletters gave me a perspective on how views have changed since our inception as a DPG. Integrative and Functional Medicine and IFMNT are no longer considered unconventional approaches to nutrition and health care, but the way of the future. I would like to think that the newsletter, under my editorship and the exemplary team members with whom I have worked, has been a significant factor in making this happen. I am confident that with Incoming Editor Jena Savadsky Griffith, RDN; our Copy Editor Holly Van Poots, RDN, CSP, FAND; CPE Editor Shari Pollack, MPH, RDN, LDN; and the many other members who make up the team, this trend will continue. Thank you to each and every one of you for your dedication to our efforts.

The theme for this issue and CPE article has been a long time in the making—maybe even before the issue of opioid abuse took a forefront. The timing of this information could not be better and will hopefully provide members with ideas on how to help those who are experiencing pain. Many authors contributed to this issue providing a wealth of knowledge, information, and options for those of us working with patients and clients in pain.

I look forward to having more time to devote to some of the “hobbies” I have, as well as continuing occasional PRN work, writing and editing here and there, and most of all, having more downtime and the opportunity to enjoy springtime (and soon to be summer) in the Rockies.

Please join me in welcoming Jena as editor of The Integrative RDN and the return of many of the familiar newsletter team members. I will work closely with Jena and the other team members, as I have been doing the past few months, to ensure a smooth transition. My desire is to maintain close contact with DIFM, our members, and the executive committee and to continue to promote DIFM’s mission.

Wishing all members the best in the upcoming year and future. 

Sarah

Editor’s Notes

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Sarah

Editor’s Notes

As my tenure as Newsletter Editor for Nutrition in Complementary Care, now Dietitians in Integrative and Functional Medicine (DIFM), winds down, I think back over the past 17 years and how much has changed. Packing up 17 years of newsletters gave me a perspective on how views have changed since our inception as a DPG. Integrative and Functional Medicine and IFMNT are no longer considered unconventional approaches to nutrition and health care, but the way of the future. I would like to think that the newsletter, under my editorship and the exemplary team members with whom I have worked, has been a significant factor in making this happen. I am confident that with Incoming Editor Jena Savadsky Griffith, RDN; our Copy Editor Holly Van Poots, RDN, CSP, FAND; CPE Editor Shari Pollack, MPH, RDN, LDN; and the many other members who make up the team, this trend will continue. Thank you to each and every one of you for your dedication to our efforts.

The theme for this issue and CPE article has been a long time in the making—maybe even before the issue of opioid abuse took a forefront. The timing of this information could not be better and will hopefully provide members with ideas on how to help those who are experiencing pain. Many authors contributed to this issue providing a wealth of knowledge, information, and options for those of us working with patients and clients in pain.

I look forward to having more time to devote to some of the “hobbies” I have, as well as continuing occasional PRN work, writing and editing here and there, and most of all, having more downtime and the opportunity to enjoy springtime (and soon to be summer) in the Rockies.

Please join me in welcoming Jena as editor of The Integrative RDN and the return of many of the familiar newsletter team members. I will work closely with Jena and the other team members, as I have been doing the past few months, to ensure a smooth transition. My desire is to maintain close contact with DIFM, our members, and the executive committee and to continue to promote DIFM’s mission.

Wishing all members the best in the upcoming year and future. 

Sarah
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