More than 11 million residents in the United States have a history of cancer. Advances in treatment have greatly increased chances of survival for many cancers and reduced mortality. From 1991 to 2015, the overall cancer death rate fell 26% in the United States.¹ In 2016, there were an estimated 15.5 million cancer survivors in the United States, and the number of cancer survivors is expected to increase to 20.3 million by 2026.¹

After treatment, one of the top priorities expressed by survivors is preventing cancer recurrence. Registered dietitian nutritionists (RDN) can play a key role in this prevention. According to the World Health Organization, 30% to 50% of cancer cases can be prevented through adopting healthy lifestyle choices and reducing risk factors like smoking, lack of physical activity, dietary factors, obesity, and alcohol use.² A healthy detoxification system plays a critical role as well, which can be enhanced through dietary changes.

One significant piece of this detoxification pathway is Nuclear factor-erythroid 2-related factor-2 (Nrf2), a transcription factor, and its upregulation, which may have anti-cancer implications.³ Emerging evidence has demonstrated that genetic polymorphisms in the Nrf2 gene may be associated with cancer development, indicating that there is a potential link between carcinogenesis and the Nrf2 pathway.⁴ Not only is Nrf2 a promising target for preventing carcinogenesis, but also other chronic diseases, including cardiovascular diseases, neurodegenerative diseases, and pulmonary injury.⁵ So far, the beneficial role of Nrf2 induction has been widely explored at multiple organ sites including skin, lungs, bladder, breast, colon, pancreas, stomach, and oral cancer.⁶ Through significant Nrf2 inducer capacity, sulforaphane compounds induce Nrf2 capacity, aiding the body’s detoxification system.⁷ Sulforaphane is a naturally occurring isothiocyanate with high bioavailability found predominantly in cruciferous vegetables.

Supporting this natural system immediately following treatment and in the years after is important. However, other common concerns, even 5 to 10 years after cancer treatment, are the side effects that survivors can experience. RDNs can recommend lifestyle changes and dietary interventions to mitigate these symptoms or lessen their severity.
Thank you for your patience as it’s been more than a few months since we’ve brought you an edition of the newsletter. Like several other DPGs, we needed time to readjust, get our content in order, and refocus amidst a radically changed backdrop. We remain incredibly grateful for your support and membership.

No doubt you have been affected by all that you’ve experienced these past months, in varying degrees, both personally and professionally. As nurturers, caregivers, and those who practice in service to the better health of our communities, I dare say we feel the effects of these times greatly. One thing that has become clear is that the pandemic has highlighted and magnified the inherent social problems of chronic disease, racial disparity, and a broken health care system. One revelatory outcome, reflected in this *JAMA observational study* of 5700 COVID-19 patients in New York, is that 88% of those hospitalized had at least two chronic conditions. It is no coincidence that *88% of the US population* is currently metabolically unhealthy. We have several pandemics within a pandemic, but lifestyle medicine—the essence and core philosophy of our profession—can and should be leading the way. For some guidance, please take a look at the Resource Review section for a sampling of the integrative and functional medicine literature that has recently come out regarding diet, lifestyle, and immune health. At the very least, correcting baseline inflammation is one key actionable step to optimizing health and building resilience. Additionally, please check out my article focusing on COVID-19 and infection prevention with supplementation, highlighting the trace mineral zinc.

Before the pandemic, our original theme for this newsletter was oncology, and we’re grateful to present Vivianne Swart’s continuing education article on integrative nutrition strategies after cancer treatment. We are working diligently behind the scenes to get all CPE quizzes and materials transacted digitally. Thank you also to RDN Anu Kaur and yoga therapist Maryam Ovissi for giving us insight into their integrative and collaborative approach to successfully working with cancer patients.

To reiterate, we are always looking for article suggestions, writers, and feedback. Please email me anytime at *jenas_mailbox@yahoo.com* or find me on Instagram @jenagee.rd. Thank you so much for taking the time to read. We wish you good health and strength as we muster through these stressful times!
I hope this issue finds you well and staying healthy. Much has happened since our last newsletter and the entire world has been struggling with unprecedented hardship and strife. While we mourn the immeasurable loss of life, livelihoods, milestone celebrations, hopes, and dreams, I sincerely hope that during these most challenging of times each of you have been able to identify some silver linings amongst all of the chaos. I am grateful for the opportunities that have arisen from these crises—being able to spend more time with my family, tackle some of those home and business improvement projects that kept getting pushed to the backburner, still finding joy and blessings each day, but I am most grateful for the respite our planet had been granted while we all have been staying home. I sincerely pray that the environmental impact as a result of our shifting lifestyles does not get overlooked and forgotten. Let us try to learn as much as we can and take the steps necessary to honor those lessons.

Maybe you have been doing more telehealth, catching up on some book club selections, or have been inspired to focus energy into advocacy projects. I’m not sure what things will be looking like in your city or state by the time this issue lands in your inbox, but I hope it finds you asking some critical thinking questions about our practice area, roles as IFN providers, and obligations to society in the face of pandemics, social injustices, and planetary health.

It’s hard to believe that my term as Chair has come to a close but as I pass the torch to Kory DeAngelo, I know that her vision for this coming year continues to resonate in her own way with this past year’s theme of Enlighten, Energize, Empower.

May each of you know that DIFM holds each of you dear to our hearts and we wish to hear how your lives have been impacted and what can we do to support you—our valued members!

Please keep in touch and let me and Kory know what DIFM can do for you!

In health & wellness,

Dana

As I enter my Chair year this summer, I am reminded why I love being part of our DIFM community and the positive and transformative work that integrative and functional dietitians are doing. I want to especially recognize the efforts of our Diversity Committee, who have taken the lead in supporting our DIFM community during this historically challenging time. The message is clear: we are here for you. How can we be the change we wish to see in our profession? Our leadership team is prioritizing how DIFM’s offerings this year can further support Diversity, Equity, and Inclusion (DEI) principles. We expanded our Diversity Committee into the DEI Committee and have plans to partner with other DPGs and MIGs to provide educational and networking opportunities to foster personal and professional growth. We will continue to strive to create a more inclusive profession, which may involve some uncomfortable but rewarding practices.

This year, we will continually ask what our members need in order to provide the most support, community, and connection. To achieve this, we will be setting goals quarterly to be able to adapt to what is happening in the present moment to support our members best. FNCE® will be a virtual experience this year and the DIFM leadership team is busy brainstorming our online offerings. It has been an extraordinarily difficult year for many of us, and I am hopeful that this time will allow us to dig deep, address root causes, and cultivate a stronger and more inclusive profession. I so appreciate working with such a kind and compassionate group of RDNs, and I look forward to hearing from you on how we can best support you this year!

Warmly,

Kory
Nrf2 and Detoxification

Exposure to intrinsic/extrinsic factors, including various toxic chemicals, oncogenes, viruses (e.g., hepatitis B virus or HBV), reactive oxygen species/reactive nitrogen species (ROS/RNS), and inflammation, can result in genetic mutations and/or epigenetic alterations that cause the initiation of carcinogenesis in healthy cells. Several dietary phytochemicals in fruits and vegetables have been shown to possess cancer-preventing effects in both preclinical animal models and human epidemiological studies. These phytochemicals are theorized to prevent the initiation of carcinogenesis via either direct scavenging of reactive metabolites or, more importantly, the induction of cellular defense detoxifying/antioxidant enzymes, like Nrf2. These defense enzymes mediated by Nrf2 contribute to cellular protection against ROS/RNS and reactive metabolites of carcinogens.

Considering that Nrf2 signaling pathway can regulate at least 600 genes, 200 of which encode cell-protective proteins that are involved in diseases and the dynamic connections between diseases and drugs, modulating Nrf2 activity is a promising approach in inflammatory and painful diseases. Through focusing on raising the transcription factor Nrf2, survivors can begin to build a cancer-fighting diet.

Nrf2 and Phytochemicals

In experimental studies, the chemopreventive role of Nrf2 inducers was mainly addressed by using the naturally occurring isothiocyanate, sulforaphane. Sulforaphane has received attention because of its ability to simultaneously modulate early stages of carcinogenetic events (initiation) or hamper steps involved in cancer development. Mechanistically, sulforaphane, via Nrf2, promotes DNA protection by using the naturally occurring inducers was mainly addressed.

Sulforaphane: Dietary Sources

The liver has many detoxification and anti-oxidative stress functions. Research into human biotransformation and elimination systems continues to evolve. Various clinical and in vivo studies have been undertaken to evaluate the effects of foods and food-derived components like dietary phytochemicals on the activity of detoxification pathways, including phase I cytochrome P450 enzymes, phase II conjugation enzymes, Nrf2 signaling as discussed previously, and metallothionein. Cancer survivors should not do a liver cleanse after treatment; instead, practitioners can work with patients to enhance their natural biotransformation system through supporting liver function, in particular by incorporating the intake of sulforaphane-containing cruciferous vegetables such as broccoli, cauliflower, kale, and more.

High intake of cruciferous vegetables has been associated with lower risk of various cancers, and the cancer preventive effect of these vegetables has been linked to their high levels of glucosinolates. The hydrolysis of glucosinolates results in the generation of bioactive compounds, including allyl nitrile, an active inducer of some phase II detoxification enzymes. The glucosinolate hydrolysis products and selenium derived from crucifers protect against cancer through altered estrogen metabolism.

Applying dietary phytochemicals at the early stage of carcinogenesis may block further development of carcinogenesis. Treatment with dietary phytochemicals and/or relatively non-toxic therapeutic drugs on cancer cells may induce cellular indices of stunted cancer progression, including autophagy, cell cycle arrest, apoptosis, and differentiation, and may block tumor development.

A recent review published in 2018 from Frontiers in Pharmacology stated, “Enhancing Nrf2 is essential for the prevention of cancer.” However, the research surrounding the activation of Nrf2 through dietary approaches is still in its infancy; this is a promising area of research to watch in the oncology field. A well-balanced diet rich in dietary phytochemicals may have chemopreventive effects through Nrf2, but the magnitude of an effect on cancer survivorship outcomes is still under study.

Sulfuraphane: Dietary Sources

- **anacardic acid (cashew nuts)**
- **cafeic acid and chlorogenic acid (coffee)**
- **genistein (soy)**
- **EGCG (green tea)**
- **indole-3-carbinol (cruciferous vegetables)**
- **6-gingerol (ginger)**
- **lycopene (tomato)**
- **quercetin (citrus)**

Prevention trials using whole foods or simple extracts offer additional prospects for reducing this expanding burden of cancer effectively and frugally in contrast to promising isolated phytochemicals or pharmaceuticals. Combined modification of diet and behavior constitute one of the only available tools for widespread change in many populations in the developing world. Besides sulforaphane there are other molecules with distinct mechanisms that have therapeutic effects in cancer by targeting Nrf2, including phenethyl isothiocyanate (also found in cruciferous vegetables), oltipraz, curcumin (found in turmeric), resveratrol (found in grapes), fumaric acid and its esters, and synthetic oleanane triterpenoids. However, interestingly, compared with widely used phytochemical-based supplements like curcumin, silymarin, and resveratrol, sulforaphane more potently activates Nrf2 to induce the expression of a battery of cytoprotective genes. Rather than drinking a glass of red wine nightly for resveratrol, eating a cup of cruciferous vegetables daily would be a more prudent dietary phytochemical goal.

Because they are low-cost, practical, tolerable, safe, and effective, foods containing bioactive phytochemicals are gaining significant attention as components of chemoprevention strategies against cancer. RDNs play a key role, translating this research and evidence into action-based steps survivors can take to reduce their risk of cancer recurrence.

Other specific phytochemicals that can be part of a cancer-fighting diet include:

- **anacardic acid (cashew nuts)**
- **cafeic acid and chlorogenic acid (coffee)**
- **genistein (soy)**
- **EGCG (green tea)**
- **indole-3-carbinol (cruciferous vegetables)**
- **6-gingerol (ginger)**
- **lycopene (tomato)**
- **quercetin (citrus)**

Applying dietary phytochemicals at the early stage of carcinogenesis may block further development of carcinogenesis. Treatment with dietary phytochemicals and/or relatively non-toxic therapeutic drugs on cancer cells may induce cellular indices of stunted cancer progression, including autophagy, cell cycle arrest, apoptosis, and differentiation, and may block tumor development.

A recent review published in 2018 from Frontiers in Pharmacology stated, “Enhancing Nrf2 is essential for the prevention of cancer.” However, the research surrounding the activation of Nrf2 through dietary approaches is still in its infancy; this is a promising area of research to watch in the oncology field. A well-balanced diet rich in dietary phytochemicals may have chemopreventive effects through Nrf2, but the magnitude of an effect on cancer survivorship outcomes is still under study.

Sulfuraphane: Dietary Sources

The liver has many detoxification and anti-oxidative stress functions. Research into human biotransformation and elimination systems continues to evolve. Various clinical and in vivo studies have been undertaken to evaluate the effects of foods and food-derived components like dietary phytochemicals on the activity of detoxification pathways, including phase I cytochrome P450 enzymes, phase II conjugation enzymes, Nrf2 signaling as discussed previously, and metallothionein. Cancer survivors should not do a liver cleanse after treatment; instead, practitioners can work with patients to enhance their natural biotransformation system through supporting liver function, in particular by incorporating the intake of sulforaphane-containing cruciferous vegetables such as broccoli, cauliflower, kale, and more.

High intake of cruciferous vegetables has been associated with lower risk of various cancers, and the cancer preventive effect of these vegetables has been linked to their high levels of glucosinolates. The hydrolysis of glucosinolates results in the generation of bioactive compounds, including allyl nitrile, an active inducer of some phase II detoxification enzymes. The glucosinolate hydrolysis products and selenium derived from crucifers protect against cancer through altered estrogen metabolism.
protection against ROS, altered detoxification by induction of phase II enzymes, decreased carcinogen activation by inhibition of phase I enzymes, and slowed tumor growth and induction of apoptosis. Results from animal experiments show that cruciferous vegetable intake reduces chemically induced tumor formation.

For reasons of experimental necessity, pre-clinical studies have focused principally on sulforaphane itself, while clinical studies have relied on broccoli sprout preparations rich in either sulforaphane or its biogenic precursor, glucoraphanin. A 2015 mouse study looked at the ability of broccoli sprout extract to protect against acute liver injury. The researchers were able to demonstrate that broccoli sprout extract protected the liver from various types of xenobiotic substances through induction of detoxification enzymes and glutathione synthesis. The concentration of glucoraphanin in the broccoli sprout extract diet was adjusted to 340 mg/100 g diet. If calculated by the daily food intake (approximately 15 g) by a rat, and the body weight of a rat (approximately 200 g), researchers estimated that rats consumed about 200–300 mg/kg of glucoraphanin every day. While specific intake of glucoraphanin in humans through a cruciferous vegetable-rich diet is not available, a study analyzed a total of 73 samples comprising nine types of cruciferous vegetables for their isothiocyanate content. Researchers observed a wide range of isothiocyanate content across the individual vegetables with an average level of 16.2 μmol/100g wet weight, ranging from 1.5 μmol in raw cauliflower to 61.3 μmol/100g in raw mustard greens.

In a similar vein, a series of studies have been undertaken in Qidong, China, a region known as a “hot-spot” for hepatocellular carcinoma because of co-exposures to HBV and aflatoxins. In a recently completed 12-week placebo-controlled, randomized clinical trial, 291 participants from Qidong were provided a broccoli sprout beverage containing both 40 μmol sulforaphane and 600 μmol glucoraphanin. The urinary levels of the mercapturic acids of the air pollutants benzene and acrolein were measured and used as biomarkers of health risk. The levels of excretion of the glutathione-derived conjugates of benzene (61%) and acrolein (23%) were significantly higher in the participants who received the broccoli sprout beverage compared with placebo. This increase in pollutant-mercapturic acid excretion was rapid and sustained throughout the broccoli sprout beverage intervention. Researchers concluded that the detoxification of these airborne pollutants was enhanced by the broccoli sprouts beverage.

Despite the growing evidence for the importance of cruciferous vegetable intake in cancer prevention, the American Institute of Cancer Research estimates that if the only dietary change made was to increase the daily intake of fruits and vegetables to 5 servings per day, cancer rates could decline by as much as 20%. As such, encouraging patients to eat more cruciferous vegetables will likely yield a net benefit regardless of the potential positive factors on detoxification or Nrf2.

To illustrate this point, a study done by Thomson et al. sought to evaluate the association between breast cancer recurrence and vegetable intake including analyses stratified on tamoxifen use. To assess the association between vegetable intake and breast cancer recurrence, vegetable intake from repeat 24-hr dietary recalls were examined as a secondary analysis of 3,080 breast cancer survivors enrolled in the Women’s Healthy Eating and Living (WHEL) Study. At the time of enrollment women were, on average, 23.5 months post-diagnosis. The hazard of recurrence with vegetable intake was assessed overall and separately for women taking tamoxifen. Researchers found that women with the highest reported intakes of total vegetable intake at their baseline measure had an overall lower hazard for breast cancer recurrence or new primary breast cancer. The reduction in hazard risk for recurrence attributed to higher vegetable intake was most significant in women taking the selective estrogen receptor modulating drug, tamoxifen.

### Addressing Side Effects in Survivorship

Although the cycles of chemotherapy or radiation sessions may be finished, patients can experience side effects of cancer treatment for years. Some of the most common side effects are fatigue, weight gain, gastrointestinal symptoms, “chemo brain,” and/or hair and skin problems. For example, women diagnosed with breast cancer report that post-chemotherapy cognitive deficits negatively impact quality of life and may last up to ten years after treatment.

**Fatigue.** Fatigue has many etiologies. The patient may not be sleeping enough, and it might be helpful to recommend the following interventions: no electronics 60 to 90 minutes prior to bed, keeping a consistent bedtime, not eating within 2 hours of bedtime, and aiming for 7 to 8 hours of sleep per night. Lack of physical activity can also increase fatigue; patients can start by adding walking throughout the day, and working toward the goal of 150 minutes of moderate physical activity weekly as recommended by the American Cancer Society. Initial evidence indicates that interventions with cancer patients including physical activity, cognitive behavioral therapy, and mind-body interventions have moderate effectiveness in improving sleep measures and quality of life.

As part of their assessment, RDNs can ask about fluid intake to assess hydration status; adequate hydration and electrolyte balance are essential in preventing and treating fatigue according to the clinical practice guidelines in oncology. Additionally, a diet high in simple sugars and low in antioxidant-containing foods like fruit and vegetables may contribute to fatigue. Adjusting to a Mediterranean-style dietary pattern may help alleviate fatigue. In one population of breast cancer survivors, higher soy and cruciferous vegetable intake was associated with less treatment-related menopausal symptoms and fatigue. Patients may not be meeting their protein needs resulting in a feeling of low-energy; in a 2013 review, after evaluating the evidence, an international expert panel recommended an average daily intake of 1 to 1.2 g/kg protein
per day for those aged 65+ years and even higher intakes for those who are exercising and otherwise active.49

If a patient continues to struggle with fatigue despite these interventions, it may be helpful to work with a physician to get blood tests ordered or refer out to a psychologist if the patients is having trouble with stress management. The following lab tests may be helpful: iron panel, thyroid panel, vitamin D status, and vitamin B12 status. Supplementation may be indicated depending on results.

For B12 supplementation, it may be prudent to recommend methylated forms over non-methylated B12 because of possible MTHFR mutations. Two polymorphic variants in this gene (C677T and A1298C) have been implicated in a mild form of MTHFR deficiency associated with hyperhomocysteinemia. Mild to moderate hyperhomocysteinemia has been previously implicated as a risk factor for cardiovascular disease. Furthermore, the presence of these variants, with and without mildly elevated levels of homocysteine, has been studied in relation to several multifactorial disorders including cancer.50-52

Weight Gain/Loss. Although it is common for patients to lose weight during chemotherapy due to side effects like taste changes and loss of appetite, many patients regain lost weight post-treatment. This pattern is more common in cancers with higher survival rates. One study of 993 obese women with stage I-II-III breast cancer looked at weight changes during treatment (including modalities like chemotherapy and surgery). Researchers found that 14.1% women gained weight, 67.3% remained stable, and 18.6% lost weight.53 With 39.8% of US adults classified as obese, weight loss is a subject on many patients’ minds.54 Obesity has also been linked with up to six different cancers, with inflammation a likely modulating factor.55 Thus although many patients may be weight-stable during treatment, those who are carrying excess weight may be more motivated to pursue a normal weight to decrease risk cancer recurrence or development of a new cancer.

Rather than focus on a simple calories in/calories out approach, increasing plant foods and decreasing inflammatory foods may be a more prudent lifestyle intervention. This allows the patient to be less focused on the number on the scale, and more focused on a nutrient-rich, balanced diet.56 Nutrition interventions that emphasize healthy behaviors (eg, eating more home-cooked meals, increased intake of nutrient-dense foods, and regular physical activity), provide practical skills (eg, cooking for one or two, adding more plant-based foods to menu), and foster a sense of confidence and self-efficacy about lifestyle choices, may result in weight loss for some individuals, but for most will improve overall health and well-being.57

Age contributes to weight gain for multiple reasons. First is the natural loss of muscle tissue that occurs with aging, known as sarcopenia, that can contribute to obesity through negative impacts on metabolic health.56 Muscle loss associated with sarcopenia is gradual and appears to be less than 10% up to the fifth decade of life, whereas 30% to 40% of muscle is lost between 50 and 80 years of age.58 Sarcopenia is a process that occurs in both men and women and is associated with decreased mobility, reduced muscle strength, increased fat mass, decreases in resting energy expenditure,59 and insulin resistance.58 Additionally, previous research has demonstrated that adults generally underestimate their calorie intake and overestimate energy expenditure.60 Many survivors may not realize this effect and do not adjust their caloric intake as they age, resulting in unwanted weight gain.

It is common for patients to look toward fad diets after treatment like the alkaline diet or ketogenic diet to address their concerns of cancer recurrence and weight loss. It is important to avoid being dismissive of patients, and instead try to find middle ground, taking healthful pieces of what they bring to the table, and addressing larger misconceptions. For example, many patients may want to start the ketogenic diet because they have heard that “sugar feeds cancer.” The clinician can then explain how excess intake of simple sugars can increase inflammation, which is linked to cancer, and discuss ways to moderate sugar in the diet, rather than cutting out all carbohydrates. This is also an education opportunity to explain the importance of fiber in cancer prevention, and reference higher carbohydrate cancer-fighting foods.61 The World Cancer Research Fund/American Institute for Cancer Research recommends eating a diet rich in whole grains, vegetables, fruit, and beans, while limiting consumption of fast food, red and processed meats, sugar-sweetened drinks, and alcohol to reduce cancer risk.62

Gastrointestinal Issues. Patients frequently experience diarrhea/constipation while receiving treatment, but it usually resolves, if due to a medication side effect, after treatment. Some patients may continue to struggle with these symptoms, however, even years after treatment. Patients concerned about bloating, gas, and other IBS symptoms could try the low-FODMAP elimination diet (under guidance of an RDN) to identify trigger foods. Patients may be consuming too little water, resulting in constipation, or may not be consuming enough fiber, resulting in diarrhea. National consumption surveys indicate that only about 5% of the population meets recommendations for daily fiber intake, despite its critical importance for digestive health and reduced risk for heart disease, stroke, hypertension, certain gastrointestinal disorders, obesity, type 2 diabetes, and certain cancers.63 Evidence is still preliminary for probiotics; however, one group of researchers state, “There is a general agreement that individual probiotic strains can beneficially affect metabolic activities that occur in the gastrointestinal tract and enhance the host’s immune response.”64 During their literature review, the authors also found, “A tumor-suppressive molecule has been identified from culture supernatants of Lactobacillus gasseri ATCC334, a well-characterized probiotic. The molecule ferrichrome (a hydrophilic metal chelating agent or siderophore generated by ATCC334) exhibited its tumor-suppressive effect through the induction of apoptosis in colon cancer cells via activation of the c-Jun N-terminal kinase (JNK) pathway.”64
Incorporating probiotic-rich foods (sauerkraut, kimchi, etc) may be helpful to some patients, but a customized approach must be taken for each person. RDNs play a pivotal role in addressing GI issues post-treatment and can employ a number of individualized interventions in addition to those already discussed.

“Chemo Brain.” In the past two decades, neuropsychological studies have accumulated evidence of corresponding cognitive deficits that have mostly been attributed to neurotoxic effects of chemotherapy. The use of neuroimaging techniques, such as magnetic resonance imaging (MRI) and functional MRI (fMRI), allow the identification of structural and functional differences within the brain. Several imaging studies demonstrate that chemotherapy can induce changes in the brain, including volume reductions and changes in activity patterns. However, observations of impaired cognitive functioning occurring before the start of adjuvant or neoadjuvant chemotherapy question the singular role of chemotherapy for the cause of these deficits. There is very little evidence using dietary interventions to address “chemo brain,” particularly because the symptom itself is still not well understood. There is better evidence for what dietary approaches support cognitive function generally, and these are the interventions within the RDN scope that may be useful for patients, such as focusing on omega-3 fatty acids. Another option would be the recently developed MIND diet, which has been shown to slow cognitive decline associated with aging. The difference in decline rates for being in the top tertile of MIND diet scores in this study versus the lowest was equivalent to being 7.5 years younger in age.

One group of researchers proposed that a diet rich in marine omega-3 fatty acids may even be neuroprotective during doxorubicin chemotherapy as demonstrated by a mouse study, and another group of researchers stated that consuming diets with an adequate ratio (5:1) of omega-6:omega-3 fatty acids (Mediterranean diet) is recommended given that they are associated with better memory capacity and lower risk of cognitive deterioration. For reference, Americans consume in a ratio as high as 30:1 of omega-6:omega-3 fatty acids. Alternatively, survivors may be consuming adequate amounts of omega-3 fatty acids but too many polyunsaturated omega-6 vegetable oils, so reducing omega-6 intake is another target for intervention.

Consistent carbohydrates throughout the day are also important; low glycemic index foods seem to improve attention, memory, and functional capacity, while those rich in simple sugars are associated with difficulty in concentration and attention. Furthermore, a high intake of antioxidant-rich fruits and vegetables can help decrease chronic inflammation.

Hair/Skin/Nail Problems. Hair, skin, and nail problems are frequent complaints after cancer treatment. This can also be an issue of aging; however, RDNs should assess for any potential micronutrient deficiencies that may be contributing to these issues. Although there exists a substantial amount of market advertising and social media publicity regarding the efficacy of biotin therapy for the improvement of hair quality, in reality the only human health condition for which there is strong evidence of biotin’s therapeutic utility is for the treatment of biotin deficiency. In industrialized countries such as the United States, true biotin deficiencies remain rare because the production of biotin from intestinal bacteria remain sufficient to meet the body’s daily requirements.

The exception to this would be in cases of acquired and inherited causes of biotin deficiency as well as pathologies, such as brittle nail syndrome or uncombable hair, where biotin supplementation may be of benefit. Because of this, biotin supplementation is not usually recommended for hair/skin/nail health in the cancer survivorship population, although if patients are persistent, foods high in biotin may be recommended such as egg yolks, organ meats, fish, meat, dairy, nuts, seeds, spinach, broccoli, cauliflower, sweet potatoes, yeast, whole grains, and bananas. An anti-inflammatory diet as previously discussed would be the first-line approach, incorporating adequate protein and omega-3 fatty acids, as well as assessing for any potential micronutrient deficiencies such as iron or zinc.

Conclusion

Integrative dietary approaches in cancer survivorship can vary and should be based on the individuality of each patient. It is critical to support patients as they focus on sustainable lifestyle changes. This may mean supporting their natural detoxification system by increasing their cruciferous vegetable/sulforaphane intake (inducing the Nrf2 pathway and phase II detoxification), increasing physical activity to combat fatigue, guiding them through an elimination diet, increasing their marine omega-3 fatty acid intake or decreasing omega-6 fatty acid intake for cognitive support, and/or assessing for micronutrient deficiencies that may be impacting hair/skin/nail health.

References

CPE Activity: New Instructions

New Instructions for Completing the CPE Activity for Credit

1. Access the Continuing Professional Education article from the eatrightStore: https://www.eatrightstore.org/dpg-products/difm. DIFM members will receive the articles for $0. Non-DIFM members can purchase CPE for $24 (Academy members) or $54 (non-members).

2. Check your email for instructions on how to access the CPE Activity.

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

4. After passing the quiz, claim your credits, view/print your certificate, and access your CPEU credit history through http://eatrightcpe.org/.

This activity has been approved for 1.0 hours of CPE credit. You will be notified if hours are not approved.

Suggested Learning Needs Codes: 5150, 2010, 5430

Suggested Performance Indicators: 8.1.5, 6.2.3, 8.3.6
Supplementing Zinc for the Prevention of COVID-19 & Other Infections

Jena S Griffith, RDN, IHC

“Dietary supplements, including vitamins, minerals, essential fatty acids, amino acids, flavonoids, herbs, and accessory food factors, are among the most valuable and safe substances for prevention and treatment of serious chronic and acute diseases associated with mortality, as well as everyday health problems that cause discomfort and disability. It is important to take adequate doses for their full benefits. Because they prevent deficiency diseases at low doses, they have acquired a reputation for being necessary only at these low levels. As a result, many physicians ignore the value of much higher doses that are useful for therapeutic purposes and protection from age-related degeneration.”

From the start of the pandemic there has been an obvious uptick in integrative and functional medicine research articles, letters, and literature focusing on diet and lifestyle strategies to support immune health. For as we know, if we increase the overall health of the human host, we increase immunity and resilience. What has also been made clear is that individuals with chronic health conditions, especially metabolic dysfunction, are more severely affected by COVID-19. For clarity, SARS-CoV-2 is the virus that causes the disease COVID-19. You can test positive for SARS-CoV-2 and not have COVID-19.

At the same time, demand for vitamin and mineral supplements has increased, with many products backordered or sold out, clearly indicating consumers—and practitioners—are stocking up.

Historically, and often to our detriment, nutrition research focuses on the effects of one nutrient on one condition. There is less research highlighting the synergistic and more powerful combined effect of these nutrients and supplementing a specific vitamin or mineral at higher doses. However, not only is there definite evidence, but there are a few nutrients that stand out, not just for COVID-19, but for all immune health. RDNs need to be able to understand, personalize, and guide supplementation as a potential therapeutic prevention and possibly, as an intervention. Please refer to the COVID IFM studies in the Resource Reviews section of this issue for additional guidance and research.

Zinc is an essential mineral with many biological functions, playing critical roles in immune health, wound healing, DNA, and protein synthesis. In fact, the constant supply of zinc is crucial to the functioning and maintenance of the immune system, with even mild deficiency negatively affecting many systemic processes and gene expression.

While the Recommended Dietary Allowance (RDA) is 11 mg and 8 mg/day for men and women respectively, these recommendations often reflect the minimum amount needed to avoid deficiency rather than for the pursuit of maximum health. Additionally, the definition of RDA refers to the “needs of practically all healthy persons.” With 88% of the US population metabolically unhealthy, the current definition must be reconsidered and amounts adjusted to fit the individual and their present environment.

Those at risk for zinc deficiency include the elderly, those with autoimmune and inflammatory conditions, vegans or vegetarians, those taking zinc-depleting medications (ACE inhibitors, histamine blockers, proton pump inhibitors, cortisone, diuretics, etc) and those with digestive disorders often resulting in reduced capacity for mineral absorption. Risk factors appear to mirror the health conditions of the majority of those more severely afflicted with COVID: diabetes, kidney, liver and gastrointestinal diseases, inadequate diet, and alcohol dependency.

Additionally, zinc deficiency may be a primary factor in the majority of infectious disease and is responsible for 16% of respiratory illnesses worldwide. The use of zinc supplementation as prevention and treatment is widely practiced and approved for many disease states.

Viruses like SARS-CoV-2 are highly dependent upon the metabolism of the host cell. Ample evidence suggests zinc not only prevents viral entry into the cell, but directly reduces its virulence once inside. Early on in the pandemic it seemed apparent that symptoms of zinc deficiency and symptoms of COVID were not only intersectional but identical. (See Figure 1.) Whether cause or effect, it’s impossible to discount zinc’s integral role in prevention and/or potential intervention.

**Figure 1.**

<table>
<thead>
<tr>
<th><strong>COVID-19 Symptoms</strong></th>
<th><strong>Zinc Deficiency Symptoms</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Loss of taste &amp; smell</td>
<td>• Loss of taste &amp; smell</td>
</tr>
<tr>
<td>• Loss of appetite</td>
<td>• Loss of appetite (anorexia)</td>
</tr>
<tr>
<td>• Diarrhea/GI issues</td>
<td>• Loose stool</td>
</tr>
<tr>
<td>• Fatigue</td>
<td>• Apathy</td>
</tr>
<tr>
<td>• Dry cough</td>
<td>• Chronic cough</td>
</tr>
<tr>
<td>• Fever</td>
<td>• Fever</td>
</tr>
<tr>
<td>• Decreased immunity, white blood cell count</td>
<td>• Decreased immunity</td>
</tr>
<tr>
<td>• Pneumonia</td>
<td>• Susceptibility to pneumonia</td>
</tr>
<tr>
<td>• Lower platelets (clotting factor)</td>
<td>• Low platelets</td>
</tr>
<tr>
<td>• Increased interleukin-6 (inflammation)</td>
<td>• Increased interleukin-6</td>
</tr>
<tr>
<td>• Elevated iron storage (ferritin)</td>
<td>• Increased iron storage/transport</td>
</tr>
<tr>
<td>• Elevated C-reactive protein</td>
<td>• Increased C-reactive protein</td>
</tr>
</tbody>
</table>
Zinc is a positively charged ion and needs a transporter to enter a cell. Researchers in 2010 established that a combination of zinc plus a zinc transport molecule, or ionophore, facilitates its entry into cells and can specifically inhibit the replication of RNA coronaviruses, and potentially SARS-CoV-2. The combination of zinc + ionophore was found to be effective against the SARS coronavirus of 2003–2004, influenza, coxsackie virus, rhinoviruses, and more. In 2014, when studying its potential anticancer activity, researchers demonstrated that the antimalarial agent hydroxychloroquine was as effective as a zinc ionophore. Thus, it follows, with zinc preventing viral replication and conventional medicine’s track record of ushering in zinc over the membrane, logic directed its use with SARS-CoV-2. While still politically controversial, many physicians are using this combination as prevention and at the first sign of infection, with much underreported success. What about natural zinc ionophores? Studies suggest the flavonoid quercetin, found in apples, onions, etc, and epigallocatechin-gallate (EGCG), found in green tea and in supplement form, are also ionophores. Quercetin, a known anti-inflammatory and antiviral polyphenol, was also found to be effective in preventing the docking of the spike protein of SARS-CoV-2.

Zinc can be obtained from foods, lozenges, and pills. Lozenges are best for releasing zinc in the mouth, allowing it to travel into the nose and throat while pills are able to circulate through all tissues including lungs. Zinc is available in animal form from meat, eggs, and milk with the highest amount found in oysters. One to two oysters contain 7 to 10 mg of zinc. Top plant-based sources are pumpkin seeds, legumes, and wheat germ; but overall absorption is lower due to the inhibition of phytates. While this puts vegans at risk, as mentioned, meat eaters with compromised gut health or higher alcohol intake may also be at risk. Although serum zinc status is most often used, assessment of true zinc status is complex due to its daily fluctuations, widespread presence and tight homeostatic control, all affected by the individual's state of inflammation, hormone, and stress levels. A review identified 32 different biomarkers of zinc status and concluded that serum, urinary excretion, and hair responded most to zinc level fluctuations. However, while a low serum zinc level may accurately detect a deficiency, it is not likely adequate to detect sufficiency. Symptoms are often the best indicator.

### Nutrient Interactions

The upper limit of 40 mg/day is due to zinc’s relationship with copper as long-term supplementation can cause copper deficiency. Ideally the zinc to copper ratio would be 15:1. Food is the best source of copper; and sources includes oysters, pumpkins seeds, shiitake mushrooms, sesame seeds, whole-food vitamin C, dark chocolate, and liver. Importantly, copper is toxic to coronaviruses. Additionally, since 1941 foods have been fortified with iron, possibly to our detriment, and a potential cause of mineral imbalance. As zinc and iron compete, this may be an undervalued and hidden cause of zinc deficiency. Further, the metabolism of vitamin A—its absorption, utilization, and transport—is intricately linked with zinc status. Vitamin A, originally called the “anti-infective vitamin” in 1928, has integral roles in immune function. Thus, lowered zinc translates to less bioavailability of vitamin A. Going further, less vitamin A has downstream effects on the status of vitamin D, also a well-known player in immunity and inflammation and in a very controlled, reciprocal dance with A. When a vitamin or mineral influences hundreds of enzymes and transcription factors, it’s important to take all of these potential nutrient interactions into account. Supplementation should not be feared; however, it is not a matter of striving for an arbitrary data point but of achieving a certain degree of optimal health in the individual patient.

### Supplementation

When concerned with exposure, eating one to two oysters (or approximately 10 mg of zinc) a few times a day will provide the most absorbable form of zinc, as the body can only absorb a small amount at a time. If eating oysters is not possible, supplementing 15 to 30 mg per day can be safely consumed by adults.

There are limited studies evaluating the bioavailability of the various forms; however, zinc methionine, glycine, gluconate, sulfate, picolinate, and acetate are used most often with success. Due to phytates, supplements should not be taken with grains, nuts, seeds, legumes, or coffee. When less concerned about exposure, 15 mg per day may be sufficient. Known for “curing” the common cold, studies actually show that a minimum of 75 mg of zinc acetate per day significantly cut cold duration. Risk is generally low with high amounts of zinc for short periods of time; however, acute and chronic zinc toxicity does occur. Effects of larger doses include nausea, vomiting, cramps, diarrhea, and headaches. Further, long-term supplementation of 150 mg twice daily for 6 weeks impaired immune function by reducing activation of lymphocytes.

Although data is pending in specific regard to COVID, there is ample evidence to strongly suggest benefits of zinc supplementation. With zinc’s ability to balance the immune and redox system, its previous history of inhibiting coronaviruses, the symptomatic similarities with COVID, and importantly its effectivity with an ionophore such as quercetin, it may be as close as we can get to a preventive silver bullet. With one-third of the world deficient, including the most severely affected populations, together with its antiviral properties, it seems a disservice not to supplement with zinc, as it is a cost-efficient, widely available, and easy-to-use option with little to no risk of negative side effects.


### References


### Immune-Friendly Recipes

**Polyphenols found in tea have been linked with diverse health benefits for mood and cognition as well as the prevention of chronic disease. Green tea varieties contain catechins, such as EGCG, and flavonoids, such as quercetin. Consuming matcha green tea results in higher intakes of these phytochemicals compared to steeped varieties. In addition to matcha beverages, try these recipes to give your immune system a helping hand!**

**Cherry Matcha Chia Pudding**

**Serves 2**

- 1 cup coconut milk
- 1 cup unsweetened coconut yogurt
- 1 Tbsp maple syrup
- ¼ cup frozen cherries
- 2 Tbsp matcha green tea powder
- ¼ cup chia seeds

Combine ½ cup coconut milk, ½ cup coconut yogurt, 1 Tbsp maple syrup, cherries, and 2 Tbsp chia seeds in blender and blend until smooth. Pour into a container and refrigerate. Rinse blender, then blend ½ cup coconut milk, ½ cup coconut yogurt, 1 Tbsp maple syrup, matcha powder, and 2 Tbsp chia seeds in blender and blend until smooth. Pour into separate container. Refrigerate both overnight and layer cherry and matcha puddings into two jars before serving.

**Ginger Green Tea Smoothie**

- 1 tsp matcha green tea powder
- 1 cup almond or other non-dairy milk
- 2 Tbsp fresh ginger, grated or chopped (OR ¼ to ½ tsp ground ginger)
- Lime juice, squeezed fresh from ½ lime
- Handful of kale or other dark leafy green
- 1 small banana (or apple or pear)
- ¼ avocado

Blend all ingredients until smooth. If you don’t have a high-powered blender, try blending the leafy greens with a small amount of liquid first. Use a frozen banana and avocado for a creamier texture.

**Recipe adapted from Le Petit Eats**

**Recipe adapted from What’s Cooking Good Looking**

www.integrativeRD.org
WHY AGE GRACEFULLY, WHEN YOU CAN AGE SUCCESSFULLY? Our bodies can be younger or older than our actual age depending upon diet, lifestyle choices and physical activity. This is called biological age, which could be different than the age on your driver’s license, which is called chronological age. A recent study of over 900 adults who were tracked for 12 years, from ages 26-38, showed that people who were aging faster, meaning that their biological age was higher than their chronological age, were not as healthy or physically fit. This group was also more likely to show cognitive decline and was at a greater risk for age-related health conditions.

A growing body of research demonstrates that the keys to aging successfully are a combination of exercising regularly, keeping engaged with life, and maintaining a healthy diet with nutritious foods. These three key elements could contribute to aging gracefully, and successfully, too. POM Wonderful 100% Pomegranate Juice, known for its antioxidants, is part of a healthy diet.

THE ANTIOXIDANT SUPERPOWER IN A BOTTLE. One easy way to get a head start on aging successfully is to add something like POM Wonderful 100% Pomegranate Juice to your daily routine. POM contains pomegranate polyphenols, antioxidants known to combat unstable molecules that can cause damage to your cells. These harmful molecules are called free radicals. To maximize the polyphenol antioxidant levels, every 16oz bottle of POM contains the juice from four whole-pressed pomegranates.

An in vitro study at UCLA found that pomegranate juice has, on average, more antioxidant capacity than red wine, cranberry juice or green tea. It’s easy to enjoy all the healthy benefits of pomegranates every day with POM Wonderful 100% Pomegranate Juice. It’s great alone or added to your favorite breakfast smoothie. So make POM part of your daily routine. Your body will thank you.
Befriending Cancer Through Nutrition and Yoga Therapy: A Collaborative Approach

Anu Kaur, MS, RDN, RYT-500 / Maryam Ovissi, C-IAYT

Anu Kaur, MS, RDN, RYT-500, is a registered dietitian nutritionist who is dedicated to translating nutritional science into daily life strategies for cancer survivors and individuals interested in an integrative approach to wellness. Anu is the current DIFM Mind-Body chair.

Maryam Ovissi, C-IAYT, is the founder of Beloved Yoga in Northern Virginia (www.BelovedYoga.com) and offers a unique Befriending Yoga Therapy Program, combining polyvagal science with yoga therapy. Maryam trains teachers and utilizes a blend of evidence-based tools with yoga therapy for a modern approach to befriending the whole self.

Often after completing allopathic treatments such as surgery, chemotherapy, and radiation, cancer patients are looking to play an active role in their wellness, partly by fully understanding their choices in nutrition to prevent cancer recurrence. Research shows that nutrition can make a difference in outcomes with cancer patients. However, currently in the outpatient cancer care setting, the average ratio of registered dietitian nutritionists (RDNs) to cancer patients is 1 to 2308. Thus, patients often resort to their own means to make sense of nutrition and cancer prevention. Additionally, a cancer diagnosis often evokes feelings of vulnerability, loss, anxiety, and stress, which activates the sympathetic nervous system (SNS), the “fight-flight-freeze” branch of the autonomic nervous system (ANS). Both the SNS and the hypothalamic-pituitary-adrenal (HPA) axis are stress-response systems that elicit a release of stress (and other) hormones that may promote tumor growth and increase inflammation.

Yoga research is showing us that breathwork, movement, and mind-centering practices can help manage the ANS and hence be therapeutic tools. We, the authors—Anu Kaur, an RDN, and Maryam Ovissi, a C-IAYT—recently chatted about our work together as allied health professionals. Listen in as we discuss how the combination of yoga therapy and nutrition therapy can fill a gap in whole-person wellness strategies and deepen the healing on the cancer journey.

Experiences That Brought Us to This Point

MO: My yoga therapy experience has come through my field work (over 10,000 private yoga therapy hours) and studying with teachers like Nischala Joy Devi, Dr. Ganesh Mohan, and the Mohan family. Most importantly, through my client work, I am learning how cancer is a journey unlike other imbalances and can carry a lot of unspoken trauma. Yoga is an amazing companion through the entire continuum of cancer.

AK: Over the last two decades, I have worked as an RDN with patients on the cancer continuum from postsurgery to those undergoing allopathic treatments, such as chemotherapy, as they journey forward into survivorship. Hearing clients repeatedly speak of the stress of a diagnosis and the fear of recurrence has brought me to this place of discussing nourishment, rather than just offering prescriptive nutrition guidelines. My work has given me an appreciation for patients seeking an integrative approach that encompasses complementary modalities like yoga to improve quality of life through their cancer journeys. My own experience with yoga and the yoga research has sparked my collaboration with yoga therapists to teach cancer patients self-care through a mind-body-spirit approach.

Roles in Allied Health Care

MO: I see a yoga therapist as an allied health provider. We work to support rehabilitation and management of the body, mind, and breath. The rigor of the training yoga therapists go through develops their understanding of disease and makes them great collaborators alongside other medical providers. I also believe that the increase in yoga research has brought about a growing awareness from a medical perspective of how important it is to involve mind-centering practices, breathwork, and appropriate levels of yoga-based movement. Across a spectrum of diseases, especially cancer, we need to cultivate integrative approaches and support lifestyle/habit changes that can be impactful to the healing journey.

AK: My role is to support each person in finding their optimal nutrition through a personalized lifestyle medicine approach. Medical nutrition therapy (MNT) starts with a nutrition assessment that is shared with doctors and other healthcare providers. Equally important is the translation of that nutrition information in terms of culinary medicine, which provides clients and their caregivers practical guidance on how to nourish themselves with healthy food. As an RDN, my goal is to help boost clients’ immune systems via nutrition and to monitor for biochemical effects of treatment. Often cancer patients’ appearance or weight does not reflect the sarcopenia (muscle loss) that can occur because of the accompanying metabolic changes brought on with cancer, which makes nutrition management all the more important. My goal is to help individuals make behavioral and lifestyle changes that are long-lasting; this is where I often feel allopathic approaches alone miss the mark.

Philosophy in Cancer Care: Our Approach

MO: My approach is client-centered and trauma-informed. On the journey with cancer, the cancer itself becomes the focal point and causes trauma, which yoga teaches us can be managed with some key elements. When cancer alone is the focus, often the client develops an attitude of war with cancer, rather than one of befriending cancer. Understandably, it initially seems very hard to imagine “befriending” something you want to eradicate. A trauma-sensitive approach embodies a few key principles: (1) the power of choice; (2) commitment to present-
moment awareness through body orientation, breath, and sensation awareness; (3) use of rhythmic, repetitive, and hold methods; and (4) activating awe and wonder. In this way, a yogic trauma-sensitive approach supports us to cultivate an attitude of befriending ourselves. This is the gift cancer can offer us.

**AK:** Often, I am privy to a person’s “new normal” and how they take care of themselves. The physical changes and psychosocial stress, which can play havoc on the immune system, are factors that decrease our immune response and lead to inflammation. I start with food as medicine and focus on what to eat, along with when and how to eat (mindfully), especially given the current research on the importance of dietary patterns, mindfulness, and metabolic therapies such as fasting. Helping individuals recognize their stress response, be it long-term or from short bouts of stress, often creates an opening in the conversation to discuss self-care tools. I find if people can connect with their breath, they feel more grounded and calmer, and in many cases they have a deeper experience in connecting with feelings of satiety and mindfulness when eating. Our Befriending Cancer collaboration is done in a group setting with cancer patients, caregivers, and even allied health professionals coming together to create a sangha (community), which offers a connectedness that further supports healing.

**Expanding Support for Clients**

**MO:** The first question I ask clients on the journey with cancer is whether they have addressed their nutrition. If they haven’t, I always make a referral to Anu. From a yogic perspective, I work with clients to acknowledge the presence of the abnormal growth and appreciate its impact on the body. At the same time, we acknowledge the uncertainty the disease brings because we are still discovering what turns on and off the cancer markers in the body. Cancer affects us at the cellular level, and instead of working with cancer from a symptom-management perspective only, there is great value when we also consider the body and its building blocks. Nutrition needs much more attention here. This is why Anu and I created the Befriending Cancer Program, which combines yoga and nutrition therapy and offers a felt experience of breathing, yoga asana, and mindfully eating healthy foods, together.

**AK:** I refer people to a yoga therapist if their medical situation is complex and they have never been to a group yoga class. I want them to really understand their range of movement given their recent surgery, treatment, or symptoms before jumping into a group class. Often in the allopathic medicine setting, people have heard from their doctor that they should consider “doing yoga,” but they may be apprehensive or think of yoga only as a form of exercise. A yoga therapist has the skill set and ability to delve in deeper with emotions—viscerally, mentally, and energetically (breathwork)—and do embodied work.

**Understanding Integration in Health Care**

**MO:** I believe nutrition is essential while we are working on the mind, breath, and movement, because until the layer of nourishment is addressed, the therapy cannot fully integrate with the person. A person can meditate, exercise, and even have an extensive breathwork practice, but if they never address the layer of food, the effects of yoga tools can be limited. For example, I had a client consuming a diet that was mostly starchy carbohydrates and high in refined sugar, with some protein and very little vegetables and water. She always felt a form of congestion and sluggishness often recognized as “brain fog.” When the client began to work with Anu and address her diet, I saw a significant shift in wellness that I know I couldn’t have helped her accomplish on my own. It was amazing to see how there was a clarity of focus and a greater ability to connect to a peaceful, calm center.

**AK:** I think yoga is essential because, by educating cancer patients as to how stress activates the SNS, they become motivated to pay attention to their breath. From my perspective, elements of MNT can be enhanced if patients have the opportunity to learn firsthand how to manage inflammation, not only with diet, but by managing their stress. A growing number of RDNs are becoming yoga teachers who can use mind-body modalities such as yoga to offer more sustainability in maintaining a healthy weight, managing a chronic disease like cancer, and improving quality of life.

**Using Yoga and Nutrition to Inform Each Other’s Practices**

**MO:** Working with Anu has helped me maintain a balanced approach. Sometimes, yoga therapists can fall into what I call the “bubble syndrome”: we live in a bubble where all our choices are received with enthusiasm from the yoga clients. Anu refers clients who are outside the bubble and that allows me to look again at ways to present yoga as accessible and approachable. She supports me to become a wiser and more compassionate yoga therapist.

**AK:** Working with Maryam has offered me greater insight into my clients’ bigger picture of wellness. I have found people are calmer and often allow themselves more grace and compassion when yoga therapy is part of that picture. For example, one cancer survivor had been interested in exploring yoga but, like many others I have met, she had limited experience with yoga and concern about going to a studio. We had already incorporated some pranayama techniques to assist with sleep and fatigue, so there was an openness to meet with Maryam. After the patient signed a release-of-information consent form, Maryam and I were able to speak. Although my focus is nutrition, I encouraged the patient to do her yoga practice, as it came up in our lifestyle and behavior goals. Maryam simultaneously was able to gently remind her of some of the mindfulness nutrition goals we had set by incorporating breathwork and specific movement practices before meals. This informed my work and reinforced the value of an interdisciplinary approach with a yoga therapist for lifestyle and behavior changes in particular.

**Moving Forward in Cancer Care**

More National Cancer Institute (NCI)–Designated Cancer Centers are starting to provide information on modalities such as yoga (69%); however, fewer actually offer services themselves. The growth of
this field is dependent on using an integrative medical model of cancer care in which the entire person is seen, heard, and respected. An integrative medical model of cancer would develop plans for cancer patients that include the medical treatment plan, movement, nutrition, breathwork, meditation, and social engagement activities. The emotional stress of cancer care has been shown by many studies to be managed by yoga, breathwork, meditation, and movement. Collaborations between yoga therapists and other allied health professionals like RDNs can create a synergy for wellness and cultivate long-term lifestyle and culinary changes to support cancer patients’ journeys into survivorship. Moving forward, finding cancer centers that hire integrative health navigators and coordinators will be a key aspect to mobilizing yoga therapy and RDN support for clients with cancer. Based on our experience of the Befriending Cancer Program, we have seen the efficacy of the inclusion of yoga and nutrition therapy together.

References
Resource Review

Integrative & Functional Recommendations for COVID-19

As a human and RDN, you have, no doubt, been paying attention to the clear correlation between the severity of this virus and state of chronic disease in our nation. Emerging research is showing what we already know to be true: that diet and lifestyle can either increase our susceptibility or increase our resilience to any disease. I sense a potential shift in communicating the benefits of nutrition that has not been seen in some time. This provides an unprecedented opportunity for us, as nutrition experts, to significantly contribute to the better health of our clients, patients, families, and communities. While there have been several research papers and integrative and functional medicine organizations that have come forth with recommendations, summaries of a few are highlighted below.


Interventions depend on the stage of illness; therefore this paper presents a comprehensive four-phased approach to COVID that includes prevention, infection, inflammation, and recovery. Different aspects of the immune system are activated depending on the course of infection. During early stages, we naturally have upregulation of the inflammatory response; however, if the infection persists, then this upregulation or cytokine storm is the exact process that needs to be down regulated, and where risk of fatality is greater. Our most impactful role as IFN RDNs is certainly in the prevention phase, as outlined in the “Target 1: Foundational Support” section of the paper. Addressing diet, inflammation, stress, glycemic control, microbiome balance (connected to lung health), and movement is key in lowering risk factors and increasing resilience to all pathogens. Further support targets assessing and supplementing vitamins, minerals, and herbs with known immunological roles including recommendations (at each stage) for vitamin C, D, A, zinc, n-acetyl cysteine, glutathione, quercetin, melatonin, echinacea, astragalus, Boswellia, and more, with accompanying research for each. Figure 2 in the paper includes a proposed approach to populating the five Targets of Support across the four phases of COVID-19 disease.


The Institute for Functional Medicine currently has four sections at this link which include resources under Nutraceuticals and Botanicals (includes parts 1 and 2 for prevention, virus-specific), Resilience and Lifestyle (nutrition, sleep & stress recommendations), Practice Considerations (tools for reinvigorating and maintaining your practice during the pandemic), and Testing. The following is an example of information found in the Nutraceuticals and Botanicals section: The SARS-CoV-2 virus is said to stimulate part of the innate immune system called the NLRP3 inflammasome. There are several known natural compounds that inhibit inflammasome activity and the additional hyperinflammation associated with the virus, notably curcumin, EGCG (epigallocatechin gallate commonly found in green tea), and quercetin. Recommendations, strength of evidence, and reasoning for all possible interventions are listed.


The aim of the ANA task force completing this review was to share collective expertise towards the potential supportive role of personalized nutrition. Their summary has an understandable explanation of the virus’ replication, its entry via the cell’s ACE2 receptor, and potential targets for intervention. Interventions are divided into two categories: those that act on the immune system and/or human cells and those that act on the virus itself. A current review of the science is discussed for nutrients that have immune-modulating and antiviral properties including oil of oregano; quercetin; vitamins A, C, D, E; selenium, potassium, and zinc. Also included is a chart illustrating potential viral enzyme inhibitors that highlights the natural compounds andrographis, skullcap, hesperidin, and others.


This proposal for intervention provides suggested Ayurvedic interventions at each stage of COVID and complements India’s Ministry of Ayurveda, Yoga, and Naturopathy (AYUSH) guidelines for improving immunity released on March 31st, 2020. There are various herbal/natural compounds containing antiviral properties or protease-inhibition capability suggested for each category: unexposed, exposed with no symptoms, mild symptoms, and moderate to severe symptoms. As this will be a crucial opportunity for learning and creating credible evidence, the authors insist on proper documentation of...
all variables, outcomes, etc, and referrals if necessary. Importantly, while nothing is proven in the case of COVID, Ayurveda, similar to Traditional Chinese Medicine (successfully used in China for this virus), is to be used by identifying syndromes and suggesting remedies.


This observational study included 5700 COVID-19 patients in 12 hospitals between March 1, 2020, and April 4, 2020, in NYC and the metropolitan area. It is included here to highlight the comorbidities associated with some of the more severe manifestations of coronavirus. Over 94% of patients had at least one chronic condition, and 88% of the participants had at least two. The top three conditions were as follows: 60% had hypertension, 40% had obesity, and 33% had diabetes. This clearly illustrates that focusing on improving metabolic health, lowering baseline inflammation, and easing the burden of chronic disease in this country could positively impact risk from this and other viruses.


This may be considered more of a public service announcement and review, and is an example of true integrative medicine: using the best of conventional and natural therapies to achieve the best outcome. The M.A.T.H. protocol was developed by five physicians across the country now called the Front Line COVID-19 Critical Care Working Group (FLCCCW). It stands for methylprednisolone, ascorbic acid, thiamine, and heparin, with optional use of zinc and vitamin D. It has had a very high success rate and addresses all the central characteristics of the severest form of this disease including inflammation, hypercoagulation, and hypoxia. Visit their site for more investigation into the history, protocol specifics, and outcomes.
The Association Between Organic Food Consumption and Breast Cancer Risk

This study sought to define the association between breast cancer risk and organic food consumption secondary to the reduced intake of pesticides. Organic food consumption data came from almost 40,000 Sister Study participants (ages 35–74). Between 2003 and 2009, these participants noted their consumption of organic foods over the past year. A score was assigned to each answer (never=0, less than half the time=1, about half the time=2, and more than half the time=3). For statistical analysis of the data, adjusted hazard ratios and 95% confidence intervals were created using Cox proportional hazards model, and the statistics were adjusted for confounding factors, such as known risk factors for breast cancer. The study found that breast cancer incidences were inversely associated with consumption of organic foods, especially when the organic foods in question were produce (there was no such trend with organic dairy or meat). Although there are likely more causative factors that weren’t exposed by this study, there is at least some evidence that eating organic produce may be beneficial for preventing breast cancer.


Nutritional Genomics Research Publications – January 15, 2020


Beta-3-adrenergic receptor rs4994 polymorphism is a potential biomarker for the development of nonalcoholic fatty liver disease in overweight/obese individuals. Dis Markers.


The Potential Link Between Long-term Coffee Consumption and Risk of Cardiovascular Disease

This prospective analysis looked at people who have a genetic variant at cytochrome P450 1A2 (CYP1A2), which can cause them to be less effective at metabolizing caffeine. The study looked at whether people with this variant had a higher risk for myocardial infarction and hypertension after consuming caffeine-containing coffee. Data for almost 350,000 people in the United Kingdom was used that included genetic information and coffee habits as well as 8,368 cases of cardiovascular disease. Logistic regression was used to create an association between risk of hypertension and/or myocardial infarction and coffee intake, as well as additional inquiry regarding genetic variant of CYP1A2. The authors determined that there was a moderate association between heavy coffee drinkers (defined as consuming more than 6 cups a day) and a risk for cardiovascular disease, but this risk was not increased in those with the CYP1A2 genotype.


What’s New - Journal Reviews and Resources

Association of the Functional Medicine Model of Care with Patient-Reported Health-Related Quality-of-Life Outcomes

This retrospective cohort study followed 7,252 eligible patients (aged 18 and older; average age was 54.1 years old) to determine whether treating them with a functional medicine model of care was associated with an improvement in health-related quality of life. The studied patients visited either the Cleveland Clinic Center for Functional Medicine (1,595 patients) or Cleveland Clinic Twinsburg Family Health Center (5,657 patients) between April 1, 2015 and March 1, 2017. To be included in the study, patients needed to have a baseline Patient-Reported Outcome Measurement Information System (PROMIS) score as well as either a 6-month or 1-year follow-up score. The PROMIS questionnaire assessed different aspects of health (such as physical, social, emotional, and mental factors) and overall health, with a higher score equating to a higher health-related quality of life. Scores were divided into two categories: Global Physical Health (GPH) and Global Mental Health (GMH). Patients completed the questionnaire by themselves, either via the patient portal or on a tablet in the waiting room before appointments. Family Health Center patients had a higher median income ($72,874 vs $59,286), higher incidences of hypertension (50.9% vs 19.2%) and diabetes (34.1% vs 17.9%), and a higher baseline mean PROMIS score (48.75 vs 44.81) compared to the patients seen at the Functional Medicine Clinic. However, at the 6-month follow-up, patients at the Functional Medicine Clinic had significantly improved PROMIS GPH scores (from 46.18 to 47.77) and PROMIS GMH scores (from 46.53 at baseline to 47.84). A greater proportion of patients seen at the Functional Medicine Clinic had PROMIS GPH and GMH scores that increased by 5 or more compared to the patients at the Family Health Center. The results are not statistically significant between the 6- and 12-month follow-ups for either clinic; however, the PROMIS GPH scores did continue to go up for the Functional Medicine Clinic at 12 months. This study provides insight into how effective functional medicine can be for patients’ health and well-being and is a good indication for continued studies on this subject and research into making this model more prominent in the healthcare sector.


Compiled by Julia Shuff and Geanna Revell

News You Can Use

What’s New - Journal Reviews and Resources

Association of the Functional Medicine Model of Care with Patient-Reported Health-Related Quality-of-Life Outcomes

This retrospective cohort study followed 7,252 eligible patients (aged 18 and older; average age was 54.1 years old) to determine whether treating them with a functional medicine model of care was associated with an improvement in health-related quality of life. The studied patients visited either the Cleveland Clinic Center for Functional Medicine (1,595 patients) or Cleveland Clinic Twinsburg Family Health Center (5,657 patients) between April 1, 2015 and March 1, 2017. To be included in the study, patients needed to have a baseline Patient-Reported Outcome Measurement Information System (PROMIS) score as well as either a 6-month or 1-year follow-up score. The PROMIS questionnaire assessed different aspects of health (such as physical, social, emotional, and mental factors) and overall health, with a higher score equating to a higher health-related quality of life. Scores were divided into two categories: Global Physical Health (GPH) and Global Mental Health (GMH). Patients completed the questionnaire by themselves, either via the patient portal or on a tablet in the waiting room before appointments. Family Health Center patients had a higher median income ($72,874 vs $59,286), higher incidences of hypertension (50.9% vs 19.2%) and diabetes (34.1% vs 17.9%), and a higher baseline mean PROMIS score (48.75 vs 44.81) compared to the patients seen at the Functional Medicine Clinic. However, at the 6-month follow-up, patients at the Functional Medicine Clinic had significantly improved PROMIS GPH scores (from 46.18 to 47.77) and PROMIS GMH scores (from 46.53 at baseline to 47.84). A greater proportion of patients seen at the Functional Medicine Clinic had PROMIS GPH and GMH scores that increased by 5 or more compared to the patients at the Family Health Center. The results are not statistically significant between the 6- and 12-month follow-ups for either clinic; however, the PROMIS GPH scores did continue to go up for the Functional Medicine Clinic at 12 months. This study provides insight into how effective functional medicine can be for patients’ health and well-being and is a good indication for continued studies on this subject and research into making this model more prominent in the healthcare sector.

The rs4994 variant of the ADRB3 gene (also known as ADRB3 Trp64Arg) was found to be associated with the non-alcoholic fatty liver disease among overweight/obese subjects.


This article describes the American Nutrition Association and outlines their vision of personalized nutrition, plus five particular challenges: (1) education of professionals, (2) dissemination of information to the public, (3) public policies which need to be more favorable to nutrition, (4) nutrition stakeholders are not strongly connected and collaborating, and (5) population nutrition advice is not addressing more individualized needs.


The vision of the American Nutrition Association for personalized nutrition is described, which includes: (1) science and data, (2) education and training, and (3) clinical guidance and therapeutics.


Some of the challenges of personalized nutrition are discussed, including the proper consideration of intestinal microbiota.


The importance of nutrition and intestinal microbiota on mental health and relevant conditions like ADHD, autism, and cognition are discussed.


Table 1 lists some advances in human nutrition with regard to diabetes mellitus in the following areas: nutritional genomics, transcriptomics/gene expression, proteomics, metabolomics, lipidomics, microbiomics, and foodomics.


This editorial recommends early introduction of clinical genetics into medical education, with the goal of being able to assess the following: genetic risks, consideration of genetic testing, and/or referral to a genetic counselor.
The presenters recommended talking to our patients/clients about the following simple methods to reconnect:

- Meditate for 12 minutes
- Decrease internet usage
- Exercise
- Spend 20 minutes in nature

Healthcare practitioners can also teach their patients mindfulness (meditation styles) during nutrition or medical sessions to reduce chronic stress. Studies show stress reduction correlates with structural changes in the amygdala. Science supports the following benefits associated with meditation:

- Higher level of BDNF (brain derived neurotrophic factor)
- Improved memory
- Reduction in inflammation
- Reduced cortisol
- Improved creativity
- Improved cardiovascular health
- Improved blood sugar
- Improved sleep
- Greater concern for environmental issues

At the end of their presentation, I felt empowered with the necessary tools to help my clients incorporate one or two of these techniques to get started with making better long-term lifestyle choices.
# 2020-2021 Executive Committee Members & Leadership Team

## EXECUTIVE COMMITTEE (7 voting members)

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAIR 2020-2021</td>
<td>KORY DEANGELO, MS, RDN</td>
</tr>
<tr>
<td>CHAIR-ELECT 2020-2021</td>
<td>MELISSA GROVES AZZARO, RDN, LD</td>
</tr>
<tr>
<td>SECRETARY 2019-2021</td>
<td>MIHO HATANAKA, RD</td>
</tr>
<tr>
<td>TREASURER 2020-2022</td>
<td>DANA ELIA, DCN, MS, RDN, LDN, FAND</td>
</tr>
<tr>
<td>PAST CHAIR 2020-2021</td>
<td>MARY BETH AUGUSTINE, RDN, CDN, FAND</td>
</tr>
<tr>
<td>DPG DELEGATE 2019-2022</td>
<td>TERYN COOK BUCHANAN, RD</td>
</tr>
</tbody>
</table>

## LEADERSHIP TEAM

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONNECTING EDUCATORS CHAIR 2019-2021</td>
<td>AARTI BATAVIA, MS, RDN, CLT, CFSP, IFMCP</td>
</tr>
<tr>
<td>DIVERSITY, EQUITY and INCLUSION CHAIR 2019-2021</td>
<td>FATIMA BAHARY, RDN</td>
</tr>
<tr>
<td>DIVERSITY, EQUITY and INCLUSION ASSOCIATE 2020-2021</td>
<td>LORA SILVER, MS, RD, LD</td>
</tr>
<tr>
<td>DIVERSITY, EQUITY and INCLUSION ASSOCIATE 2020-2021</td>
<td>MANU KARKARE, MS, RDN, LDN, CLT, FAND</td>
</tr>
<tr>
<td>DIVERSITY, EQUITY and INCLUSION ASSOCIATE 2020-2021</td>
<td>ELISE HARRISON, RDN</td>
</tr>
<tr>
<td>ENVIRONMENT &amp; NUTRITION CHAIR 2020-2022</td>
<td>MARY PURDY, MS, RDN</td>
</tr>
<tr>
<td>FNCE PLANNING CHAIR 2020-2021</td>
<td>SARAH HARDING LAIDLAW, MS, RDN, MPA, CDE</td>
</tr>
<tr>
<td>MARKETING CHAIR 2019-2021</td>
<td>CHRISTA BIEGLER, RDN, LN, CLT</td>
</tr>
<tr>
<td>MEMBERSHIP CHAIR, 2019-2021</td>
<td>ANITA DAVILA, NDTR</td>
</tr>
<tr>
<td>MENTORING AND COACHING CHAIR 2019-2021</td>
<td>SANDEEP (ANU) KAUR, MS, RDN, RYT-500</td>
</tr>
<tr>
<td>MIND BODY THERAPY CO-CHAIR 2020-2022</td>
<td>STACY K. LEUNG, RYT, RDN, CDN</td>
</tr>
<tr>
<td>MIND BODY THERAPY CO-CHAIR 2020-2022</td>
<td>KATHIE MADONNA SWIFT, MS RDN LDN FAND EBQ, MBCP</td>
</tr>
<tr>
<td>NETWORK CHAIR 2019-2021</td>
<td>JOE ZASTAWNY, RDN, LD</td>
</tr>
<tr>
<td>NETWORK ASSOCIATE 2020-2021</td>
<td>JENA SAVADSKY GRIFFITH, RDN, IHC</td>
</tr>
<tr>
<td>NEWSLETTER EDITOR 2020-2021</td>
<td>HOLLY VAN POOTS, RDN, CSP, FAND</td>
</tr>
<tr>
<td>NEWSLETTER COPY EDITOR 2020-2021</td>
<td>STACI BELCHER, MS, RDN, LDN</td>
</tr>
<tr>
<td>NEWSLETTER CPE EDITOR 2020-2021</td>
<td>DINA RANADE, RDN, LD</td>
</tr>
<tr>
<td>NEWSLETTER BOTANICALS EDITOR 2020-2021</td>
<td>GEANNA REVELL, MS, RDN</td>
</tr>
<tr>
<td>NEWSLETTER NEWS YOU CAN USE EDITOR 2020-2021</td>
<td>JANIE JACOBY, MS, RDN, LD</td>
</tr>
<tr>
<td>NEWSLETTER ASSOCIATE EDITOR 2020-2021</td>
<td>CHRISSY BARTH, MS, RDN, RYT</td>
</tr>
<tr>
<td>NEWSLETTER MIND-BODY EDITOR 2020-2021</td>
<td>LISA SHKODA RDN, CSP, CNSC, FAND</td>
</tr>
<tr>
<td>POLICY ADVOCACY LEADER 2019-2021</td>
<td>ERIN SKINNER, MS, RD, IFNCP</td>
</tr>
<tr>
<td>NOMINATING CHAIR-ELECT 2020-2021</td>
<td>LISA SHKODA RDN, CSP, CNSC, FAND</td>
</tr>
<tr>
<td>NOMINATING COMMITTEE MEMBER 2020-2021</td>
<td>BONNIE BROCK, MPH, RD, LDN, ND</td>
</tr>
<tr>
<td>PROFESSIONAL ADVANCEMENT CHAIR 2019-2021</td>
<td>THERESE BERRY, MS, RDN, LD, CNSC</td>
</tr>
<tr>
<td>PROFESSIONAL ADVANCEMENT ASSOCIATE 2020-2021</td>
<td>OLIVIA WAGNER, MS, RDN</td>
</tr>
<tr>
<td>RESEARCH CHAIR 2019-2021</td>
<td>STEPHANIE HARRIS, PHD, MS, RDN, LD</td>
</tr>
<tr>
<td>SOCIAL MEDIA CHAIR 2020-2021</td>
<td>TAMARA LUCK</td>
</tr>
<tr>
<td>SOCIAL MEDIA ASSOCIATE 2020-2021</td>
<td>ALORA FREDERICK, RDN</td>
</tr>
<tr>
<td>SPONSORSHIP CHAIR 2020-2022</td>
<td>BRIDGITTE CARROLL, MS, RDN, LDN</td>
</tr>
<tr>
<td>SPONSORSHIP ASSOCIATE 2020-2021</td>
<td>DANIELLE OMAR, MS, RDN</td>
</tr>
<tr>
<td>STATE COORDINATOR, CA 2019-2021</td>
<td>SANGEETA SHRIVASTAVA PHD, MS, RDN</td>
</tr>
<tr>
<td>STATE COORDINATOR, FL 2019-2021</td>
<td>MARILYN GORDON EDD, RDN, CSSD, LDN</td>
</tr>
<tr>
<td>STUDENT MEMBERSHIP CHAIR, 2019-2021</td>
<td>SARAH ELSTER</td>
</tr>
<tr>
<td>EXECUTIVE ADMINISTRATOR/WEBSITE MGR/ EML COORDINATOR</td>
<td>AMY JARCK</td>
</tr>
<tr>
<td>ACADEMY DPG MANAGER</td>
<td>KATIE GUSTAFSON</td>
</tr>
</tbody>
</table>