CONFERENCE ISSUE

Today's Dietitian
The M Professionals
Vol. 22 No. 8
October 2020

Ethics *in the* Plant-Based Food Movement

TD speaks with dietitians of color about ethnic and racial inclusivity surrounding this powerful initiative.

Probiotics' Link to Immune Health

Tips for Meeting Weekly Seafood Requirements

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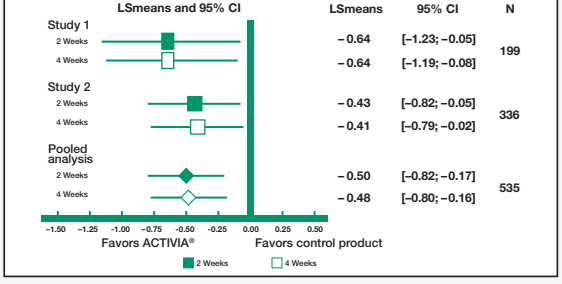
- Some individuals have trouble swallowing, or just don't like pills; but yogurt is easy and enjoyable to consume.

Forest plot of composite score of the frequency of minor digestive issues. LSmeans = least squares means; CI = confidence interval; N = number of subjects that completed the study; test for heterogeneity $P > 0.10$; test for overall effect $P = 0.003$.



ACTIVIA may help reduce the frequency of minor digestive discomfort.*

Two double-blind, randomized, placebo-controlled studies, and a pooled analysis of these studies, show that ACTIVIA may help reduce the frequency of minor digestive discomfort like bloating, gas, abdominal discomfort, and rumbling.[1,2]*

Both studies were designed to investigate the effect of ACTIVIA on different gastrointestinal (GI) outcomes, including GI well-being and frequency of minor digestive discomfort, in healthy women.

In both studies, and in the pooled analysis, the composite score of the frequency of minor digestive issues over the two-[3] and four-week[1,2] test periods in the ACTIVIA group was significantly lower (P<0.05) than that in the control group.

*Consume twice a day for two weeks as part of a balanced diet and healthy lifestyle. Minor digestive discomfort includes bloating, gas, abdominal discomfort, and rumbling.

1. Guyonnet et al. *Br J Nutr.* 2009;102(11):1654-62. **2.** Marteau et al. *Neurogastroenterol Motil.* 2013;25(4):331-e252. **3.** Marteau et al. *Nutrients.* 2019;11(1):92.

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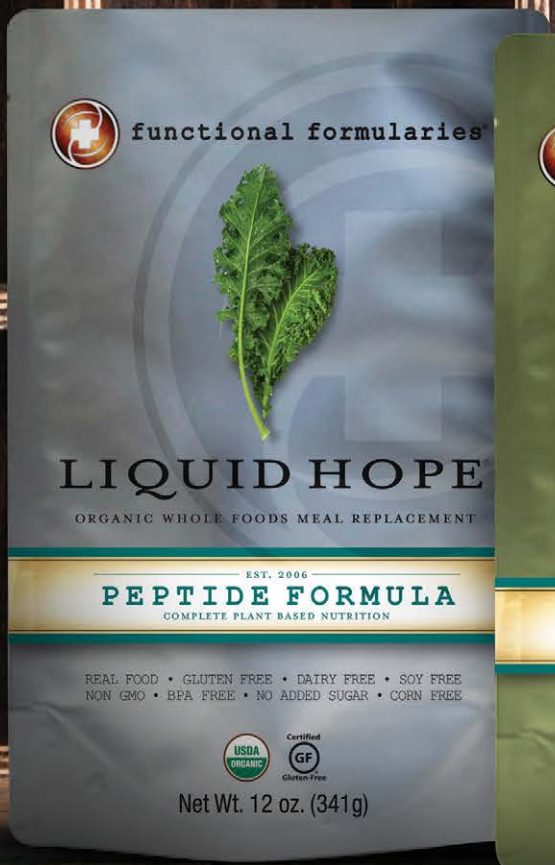

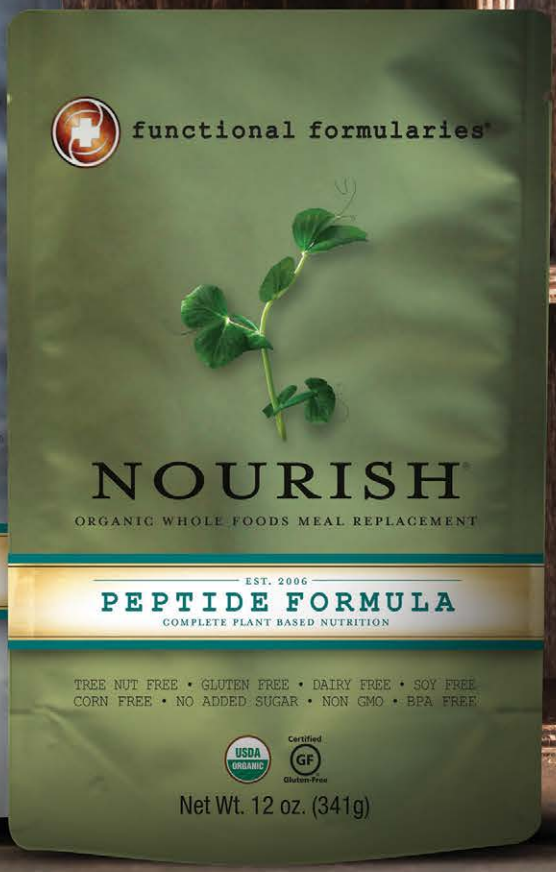

ENHANCED DIGESTION | **MAXIMUM NOURISHMENT**

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Is the BMI Racially Biased?

Conversations about health care disparities continue on. One topic still being debated is the BMI. For years, health care practitioners and RDs alike have questioned whether the BMI is a valid measure of healthy weight and overall health for the masses. Critics say the BMI doesn't account for body composition, physical activity level, body type, age, genetics, cultural diversity, or ethnicity, as there are differences in BMI and its associated health risks among African Americans, Asians, Indians, and other people of color.

Some health experts believe the BMI is a tool that "furthers the oppression of and discrimination against" African Americans and other people of color due to its origins, according to the article "The BMI Is Racist and Useless. Here's How to Measure Health Instead," published July 20 on Huffpost.com. The article says a Belgian mathematician first created the tool under another name in 1832, using data from European white men to "measure weight in different populations," not to determine individual health. Physiologist Ancel Keys reintroduced the tool in 1972 as the BMI, and the medical community has since used it as a standard measure of individual health for the general population.

The reason some call the BMI discriminatory and even sexist is because it was based on a white male study population, whose data can't be extrapolated scientifically to create a standardized measure of individual health for women and people of color. But the health care system continues to use it as such in these populations that were never part of the original cohort.

Experts say the BMI perpetuates the idea that the often-thinner bodies of whites are the standard to which everyone should be held and are therefore superior to the often-larger bodies of persons of African descent. They say using such narrow parameters to label those with larger bodies as unhealthy and overweight/obese has caused many persons of color to develop low self-esteem, depression, anxiety, eating disorders, and other health problems as they try to conform to an impossible weight standard. The same could be said for whites who don't fall within the BMI parameters.

The best way to measure patients' health, experts say, is to consider their background, stress levels, access to healthful foods, dietary and exercise habits, and other underlying health issues. Racial discrimination—and weight bias in general—against people with larger bodies won't disappear overnight, but the medical community must hold itself accountable for its part in enabling these injustices with the use of the BMI.

This month, *Today's Dietitian* continues the conversation about equality and inclusivity in the article "Ethics in the Plant-Based Food Movement," on page 24. Please enjoy the issue!

— Judith Riddle, Editor
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Today's Dietitian

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From Our *RD Lounge* Blog

Rethinking the Glycemic Index

Alka Chopra: Great insight, Constance. This is exactly how I integrate the glycemic index (GI) into my practice. Even with so many controversies I have found it useful for my clients. I have even developed a toolkit that teaches RDs how to teach the GI concept to their patients because I find them focusing too much on the single food GI numbers rather than the cumulative effect.

Constance Brown-Riggs: Thank you, Alka. Yes, it's so important to help our patients take the focus away from a single number of a single food and instead focus on nutrient density of meals and snacks, helping them build a dietary pattern that works for them and meets their individual needs.

CORRECTION
On page 12 of the August/September issue, in the article "Get Hip to a New Generation of 'Wellness' Beverages," acesulfame-K was incorrectly identified as aspartame. These are different compounds and products.

From Our **Twitter Feed**

Maximizing Performance With a Plant-Based, Dairy-Enhanced Approach (Webinar)

@KatieBrownRDN: Better together—maximize performance with a plant-based, dairy-enhanced approach. Sign up for ***Today's Dietitian***'s webinar with sports RD Marie Spano, MS, RD, CSCS, CSSD.

Sustainable Food Systems Master Class Faculty Roundtable (Webinar)

@WSU_Dietitian: I just finished the master class workshop. Loved seeing so many of my RD heroes in one space! Most engaging 3.5 hour video I've ever seen! Thank you so much!

How to Put Neglected Pantry Items to Good Use (Web Exclusive)

@integrativeRDN: PANTRY CLEANOUT: Is your pantry overflowing? Here are delicious RD ideas to use up those items! #RDchat #pantry #COVID19 #pandemic

@SharonPalmerRD: I'm sharing my top tips and recipes for putting neglected #plantbased #pantryitems to good use.

***RD LOUNGE* BLOG**

Rethinking the Glycemic Index

@MelissaJoyRD: Great points in this article: Rethinking the Glycemic Index via ***Today's Dietitian*** and Constance Brown-Riggs, MSEd, RD, CDE, CDN. #RDchat

JUNE/JULY ISSUE

Functional Foods & Cognitive Health

@MFLNNW: Functional foods. Are they worth the hype? ***Today's Dietitian*** dives into the claims and the research.

@nutritionmentor: Benefits of "functional foods" such as #mushrooms and foods that contain #omega3 include improved #cognitive function and #memory, #mood regulation, and alleviation of #anxiety. More in this ***Today's Dietitian*** article on #foodandmood. #functionalfoods

The Untold Story of Obesity

@EatRightOhio: Weight bias in #healthcare has a significant influence on patient outcomes and patient care, including #treatment and #disease management. Read "The Untold Story of Obesity" featured in ***Today's Dietitian***. #OAND #EatRightOhio

Colloidal Silver and Cancer

Q Some clients have been asking whether taking supplemental colloidal silver helps treat cancer. What does the evidence say?

A: There are many claims to the use of colloidal silver, including treating and preventing infections, hay fever, skin conditions, and cancer, and boosting immunity. However, there's no strong research to support its use for any of these reasons. Furthermore, there's evidence it can be dangerous. This article focuses on the science surrounding cancer treatment.

Colloidal silver is a suspension of microscopic silver particles in a fluid base. Silver has no known physiological function and isn't an essential nutrient.[1]

According to the Natural Medicines Database, although colloidal silver drugs were once available over the counter and via prescription, in 1999 the FDA ruled that colloidal silver isn't considered safe or effective.[1] However, colloidal silver products still are being promoted and sold as homeopathic remedies and dietary supplements.

Research

Some cell studies show possible benefits of colloidal silver for cancer prevention and treatment. A 2010 in vitro study examined the effects of colloidal silver on breast cancer cells, showing a possible apoptotic effect on MCF-7 breast cancer cells. Researchers concluded that colloidal silver might be a potential alternative agent for human breast cancer therapy but that more research is needed.[2]

A 2016 in vitro study looked at colloidal silver's relationship to immunological parameters in leukemia and lymphoma cancer cell lines. Several markers, including interleukin 2, were significantly reduced, leading researchers to conclude that colloidal silver is nontoxic to the immune system cells and may decrease cancer cell proliferation.[3] Despite these positive results, no human studies have been conducted that would strengthen silver's alleged benefit for cancer treatment.

To that end, according to the Memorial Sloan Kettering Cancer Center, silver compounds are used externally to stop or prevent infections but there's no evidence that colloidal silver has cancer-fighting effects in humans.[4]

Furthermore, the risks of consuming silver can far outweigh the potential benefits. According to the National Institutes of Health, there's no known safety or efficacy data on dietary supplements containing colloidal silver. But studies have shown that long-term oral use can be harmful. Oral colloidal silver products become most concentrated in the liver, skin, spleen, and adrenals and build up in smaller amounts in the muscles and brain.[5] Silver build-up in the skin, a condition known as argyria, can cause the skin to take on an irreversible bluish color that first appears in the gums. It also can stimulate melanin production in the skin, and areas exposed to the sun become increasingly discolored.[4]

Recommendations for Clients

Many reputable organizations warn against the use of colloidal silver for a variety of diseases including cancer. There are insufficient data to make any of these claims. If a client is taking colloidal silver, the RD should review medications, as numerous interactions are associated with them, including synthroid, penicillanine (Cuprimine, Depen), quinolone antibiotics, and tetracycline antibiotics, and with herbs and supplements such as iodine and selenium. It's also contraindicated during pregnancy and can potentially harm the fetus.[1] ■

Toby Amidor, MS, RD, CDN, FAND, is the founder of Toby Amidor Nutrition (http://tobyamidornutrition.com) and a ***Wall Street Journal*** best-selling author. Her cookbooks include ***The Best Rotisserie Chicken Cookbook***, ***The Create-Your-Plate Diabetes Cookbook***, ***Smart Meal Prep for Beginners***, ***The Easy 5-Ingredient Healthy Cookbook***, ***The Healthy Meal Prep Cookbook***, and ***The Greek Yogurt Kitchen***. She's a nutrition expert for FoodNetwork.com and a contributor to ***U.S. News Eat + Run*** and other national outlets.

For references, view this article on our website at www.TodaysDietitian.com.

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Nutritious Smoothies for Clients on the Go

Creating and consuming a nutritious, balanced breakfast is a challenge for most people. We all have busy lives, and hurried mornings often don't leave time for preparing or sitting down to eat a morning meal. This may lead to skipping breakfast altogether, grabbing something at a drive-thru, or resorting to a highly processed, prepackaged option that provides calories but not nutrient density.

Even though most of our routines have changed while staying at home for extended periods of time this year, many individuals' and families' time management skills have been put to the test with childcare and work from home responsibilities.

A common choice in the morning, smoothies serve as an opportunity for easy meal preparation when people are consistently cooking the vast majority of meals at home. However, many consumers miss the opportunity to combine multiple healthful ingredients into a full, balanced meal that's a good to excellent source of nutrients of concern such as calcium, vitamin D, potassium, and fiber.

Smoothies are a vehicle to add a wide variety of unique ingredients to the diets of those who otherwise may not consume them. Because the textures of fruits, vegetables, seeds, and protein sources become uniform when incorporated into a smoothie, palatability is improved and intake of healthful foods becomes more acceptable for many consumers. Plus, when financial resources or accessibility of certain foods are limited, smoothies are forgiving when swapping out fresh for frozen ingredients or exchanging one fruit or veggie for another.

The Basic Recipe

Ideally, a breakfast meal for most adults should contain at least 20 g protein to help prevent sarcopenia associated with aging and to more evenly spread protein consumption throughout the day for improved satiety. Kids require less protein than adults—approximately 1 g/kg of body weight—so their smoothies can contain smaller portions of high-protein ingredients.

Clients should aim for at least 5 g fiber (20% DV for women), but preferably 8 to 10 g fiber, to provide approximately one-third of the DV. To achieve this, smoothies can be designed to include the following:

- **Liquid:** a liquid such as cow's milk or nondairy milk, preferably fortified with calcium and vitamin D (note that many organic and "natural" varieties aren't fortified, and some plant milks are low in protein);
- **Protein:** at least one source of protein such as protein powder, tofu, Greek yogurt, cottage cheese, nut butter, or pulses, or a combination of foods if one item alone doesn't yield enough protein;
- **Fat:** a source of good fat such as flax or chia seeds, nuts/nut butter/powdered peanut butter, almond flour, or avocado;
- **Produce:** at least one ½- to 1-cup serving of fresh or frozen fruits or veggies (or both); and
- **Ice** if using mostly fresh produce.

Customize Add-Ins

Some outside-of-the-box nutritious ingredients to include in smoothies include the following:

- **Cottage cheese:** Packed with at least 10 g protein per ½ cup, it adds creaminess as Greek yogurt does but without the tartness. Those averse to the texture of cottage cheese are more likely to accept it in a blended medium.
- **Frozen riced cauliflower:** While quite aromatic when served cooked, frozen cauliflower adds a creamy texture to smoothies plus the fiber and nutritional benefits of a cruciferous veggie with no discernible flavor or odor.

90% OF AMERICANS CONSUME TOO MUCH SODIUM.[1]

MONOSODIUM GLUTAMATE (MSG) CAN BE A SOLUTION.

By Kathleen Zelman, MPH, RDN, Nutrition Expert for Ajinomoto Health & Nutrition

Echoed once again from the 2020 Dietary Guidelines Advisory Committee Scientific Report, Americans need to reduce sodium intake.

A new study published in the *Journal of Food Science* shows MSG may be one secret to significantly reducing sodium intake while also enhancing the flavor of better-for-you foods like whole grains and vegetables.[2]

Let's be honest, most lower sodium food can be bland, but it doesn't have to be that way. MSG has 2/3 less sodium than table salt and enhances umami deliciousness in a dish. When used as a partial replacement for salt, MSG is an effective strategy to lower sodium intake and promote health without sacrificing yummy, mouth-watering flavor.

REDUCE SODIUM BY ABOUT 40%

For everyday use, replace half of the salt in your salt shaker with MSG to reduce sodium by about 40% while maintaining appetizing flavor.

67%
of people want to learn how to use MSG[3]

59%
of people are unaware that MSG has less sodium than salt[3]

MSG 101

- Extensive research affirms the safety of MSG from organizations such as the U.S. Food and Drug Administration (FDA),[4] the Joint FAO/WHO Expert Committee on Food Additives,[5] and the European Commission.[6]
- The "G" in MSG stands for glutamate, the amino acid that imparts savory deliciousness.

For more recipes, information, and educational materials, check out:

WHYUSEMSG.COM/SODIUMREDUCTION

[1]Dietary Guidelines Advisory Committee. 2020. Scientific Report of the 2020 Dietary Guidelines Advisory Committee: Advisory Report to the Secretary of Agriculture and the Secretary of Health and Human Services. U.S. Department of Agriculture, Agricultural Research Service, Washington, DC.

[2]Halim J, Bouzari A, Felder D, and Guinard JX. The Salt Flip: Sensory mitigation of salt (and sodium) reduction with monosodium glutamate (MSG) in "Better–for–You" foods [published online ahead of print, 2020 Aug 10]. J Food Sci. doi.org/10.1111/1750-3841.15354

[3]Ajinomoto Consumer Survey of 2,500 Americans 18+. Edelman Intelligence. April 2020.

[4]U.S. Food and Drug Administration. Questions and Answers on Monosodium Glutamate (MSG). Food Additives and Petitions; 2012. https://www.fda.gov/food/food-additives-petitions/questions-and-answers-monosodium-glutamate-msg

[5]Joint FAO/WHO Expert Committee on Food Additives. Evaluation of certain food additives and contaminants: L-glutamic acid and its ammonium, calcium, monosodium and potassium salts. Geneva: Cambridge University Press; 1988.

[6]Reports of the Scientific Committee for Food, 25th Series: First series of food additives of various technological functions. Brussels, Belgium: Commission of the European Communities; 1991. http://aei.pitt. edu/40834/1/25th_food.pdf

- **Tofu:** Those who prefer to follow a 100% plant-based or vegan diet may have difficulty adding adequate protein to a smoothie. Including a plant-based protein powder or a combo of tofu and another plant protein source such as nut butter should be sufficient. Once blended, tofu takes on the flavor of the fruit and other ingredients while contributing creaminess and a vegan-friendly base. Either firm or soft/silken tofu will blend well. A 3-oz serving of soft/silken tofu provides 4 to 5 g protein, and firm contains 7 to 8 g.
- **Fiber powder:** With 95% of Americans failing to reach fiber goals of 25 to 38 g per day, fiber powder can serve as a convenient add-in to smoothies, coffee, yogurt, and more. Soluble fiber such as hydrolyzed guar gum, inulin, or soluble corn fiber will provide the best texture and approximately 5 g fiber per serving. These products can be found on popular online websites or in the supplement section of stores. For clients with irritable bowel syndrome, RDs should examine a fiber powder's sources to choose ingredients likely to be best tolerated.
- **Chia seeds and flaxseeds:** These plant-based sources of protein, fiber, and omega-3 fatty acids absorb liquid and provide bulk to smoothies for increased satiety.

Enjoy It in a Bowl

Smoothie bowls are a terrific alternative to drinkable smoothies; there's something so satisfying about topping a bowl with fruit, nuts, seeds, and/or granola and eating it with a spoon. To transform any smoothie recipe into a bowl, simply add more ice, use frozen instead of fresh fruit/veggies, and/or decrease the liquid.

There are infinite combinations of ingredients to build delicious, nutrient-dense smoothies. Accompanying this article are four smoothie recipes created by RDs that contain at least 20 g protein and 6 g fiber with little or no added sugars. Enjoy! ■

Lauren Harris-Pincus, MS, RDN, is the author of ***The Protein-Packed Breakfast Club*** and owner of Nutrition Starring YOU, LLC, which specializes in weight management and prediabetes nutrition. Follow her on social media @LaurenPincusRD and online at www.NutritionStarringYOU.com.

Wild Blueberry Peanutty Protein Smoothie

This vegan Wild Blueberry Peanutty Protein Smoothie is packed with plant-based protein and fiber thanks to a secret ingredient ... tofu.

Ingredients

¾ cup unsweetened almond milk
¼ cup powdered peanut butter
4 oz firm tofu, drained and patted dry
1 packet stevia or preferred sweetener
1 T flaxseed meal
1 cup frozen wild blueberries
A few ice cubes

Directions

1. Place all ingredients into a blender and process until smooth.
2. Serve and garnish with extra powdered peanut butter.

Nutrient Analysis per serving

Calories: 270; Total fat: 9 g; Sat fat: 0 g; Cholesterol: 0 mg; Sodium: 150 mg; Total carbohydrate: 29 g; Dietary fiber: 13 g; Sugars: 12 g; Protein: 24 g

RECIPE AND PHOTO COURTESY OF LAUREN HARRIS-PINCUS, MS, RDN

Protein + Greens Chocolate Peanut Butter Smoothie

This smoothie incorporates greens and healthful fats, resulting in a nutrient-dense, balanced meal for any time of the day.

Ingredients

½ medium banana
1 T powdered peanut butter
1 T cocoa powder, unsweetened
3 T chocolate protein powder
½ cup skim milk
1 cup spinach
1 T hemp seeds
1 cup ice

Directions

Add all ingredients to a high-powered blender, process until smooth, and serve.

Nutrient Analysis per serving

Calories: 200; Total fat: 4 g; Sat fat: 1.5 g; Cholesterol: 3 mg; Sodium: 210 mg; Total carbohydrate: 30 g; Dietary fiber: 6 g; Sugars: 15 g; Protein: 20 g

RECIPE AND PHOTO COURTESY OF HEATHER MANGIERI, RDN

Ginger Peach Mango Lassi

Packed with protein and fiber from an unexpected ingredient—lentils—this smoothie is a delicious way to start the day and can be made in five minutes.

Ingredients

½ cup nondairy or dairy milk
½ cup plain Greek yogurt
1 cup frozen mango
½ cup precooked frozen lentils
1 peach, extra ripe, pit removed
½ tsp ground ginger
Pinch of salt

Directions

Place all ingredients in a blender. Blend on high power until creamy and serve.

Nutrient Analysis per serving

Calories: 352; Total fat: 3 g; Sat fat: 1 g; Cholesterol: 5 mg; Sodium: 202 mg; Total carbohydrate: 64 g; Dietary fiber: 13 g; Sugars: 40 g; Protein: 23 g

RECIPE AND PHOTO COURTESY OF EA STEWART, RD

Apple Peanut Butter Protein Smoothie

Who doesn't love apples and peanut butter? Enjoy the flavor of one of your favorite snacks in a smoothie, especially come fall, when cider and fresh apples are the most flavorful.

Ingredients

¼ cup apple cider
2 T unsweetened vanilla almond milk
⅓ cup low-fat cottage cheese
1 tsp chia seeds
¼ cup powdered peanut butter or peanut flour
1 T old-fashioned oats
½ tsp cinnamon
1 small-medium very ripe apple, such as Gala, Fuji, or Honeycrisp (4 oz), core removed and cut into quarters
½ to 1 cup ice

Directions

Add all ingredients to a blender and process until smooth.

Notes

- Garnish with extra sprinkles of peanut butter powder, cinnamon, and tiny pieces of chopped apples.
- For a little more spice, add ½ tsp of pumpkin pie spice.
- For a sweeter smoothie, add a teaspoon or two of raw honey or a packet of nonnutritive sweetener.

Nutrient Analysis per serving

Calories: 300; Total fat: 7 g; Sat fat: 1.5 g; Cholesterol: 9 mg; Sodium: 270 mg; Total carbohydrate: 39 g; Dietary fiber: 10 g; Sugars: 24 g; Protein: 23 g

RECIPE AND PHOTO COURTESY OF LAUREN HARRIS-PINCUS, MS, RDN

Metabolic Syndrome and Cancer

Insights on Their Intersection

Dietitians know that metabolic syndrome is associated with increased risk of CVD and diabetes. In fact, risk increases more than two-fold and four-fold, respectively.[1] What's less widely known is that metabolic syndrome also increases risk of cancer, cancer recurrence, and cancer mortality.

About 1 in 3 US adults has metabolic syndrome.[1,2] It's defined by the presence of three or more of the following: high blood sugar, high blood pressure, high triglycerides, low HDL cholesterol, and elevated waist circumference. Precise definitions have changed over the years, but most authorities now refer to the "harmonized" criteria developed by a consensus of major international organizations (see table on page 16).[3,4]

In population studies, obesity and overweight are strongly linked to increased risk of at least 12 different cancers.[5] Large long-term population studies usually rely on BMI as a practical tool to categorize weight and adiposity.

When working with individuals, how can dietitians identify who's at increased risk? Researchers say assessments more precise than BMI alone are needed.[6] Work is in progress to identify biomarkers of adipose tissue inflammation that could be used in clinical practice to help identify high-risk individuals.

Meanwhile, the link between metabolic syndrome and cancer may provide important clues.

- Metabolic syndrome is associated with a 20% to more than a 60% increase in risk of colorectal, endometrial, liver, pancreatic, and postmenopausal breast cancers.[7,8]
- Among men with prostate cancer, those with metabolic syndrome are more likely to develop aggressive tumors and experience biochemical recurrence.[9]
- After a cancer diagnosis, risk of post-surgical complications, recurrence, and mortality is higher among those with metabolic syndrome.[1,10]
- For survivors of childhood cancers, metabolic syndrome is recognized as a common late effect (depending on the type of cancer and treatment), often with years of latency before it's seen.[11]

How Metabolic Syndrome Adds to Risk

Metabolic syndrome often—but not always—occurs in people with overweight or obesity.

• People with overweight or obesity. The use of waist circumference as a criterion for metabolic syndrome identifies people more likely to have excess visceral adiposity and ectopic fat deposition (mainly in the liver, heart, and skeletal muscle). Increased waist circumference in metabolic syndrome also signals likely adipocyte dysfunction, with inflammation, insulin resistance, and dysregulated secretion of hormones and signaling proteins.[12] Among National Health and Nutrition Examination Survey (NHANES) participants with overweight or obesity, cancer mortality was significantly higher among those who also met criteria for metabolic syndrome.[13]

• People with normal BMI. Some people with a BMI categorized as healthy also can have the metabolic issues associated with obesity and thus may face increased cancer risk. Metabolic syndrome despite a normal BMI tends to occur with higher body fat percentage or with greater distribution in visceral (rather than subcutaneous) adipose tissue.[13] Visceral adipose tissue plays a large role in hormonal and inflammatory secretions.

Multiple prospective cohort studies have found that among people with normal BMI, those with metabolic syndrome or related metabolic abnormalities, or with elevated waist circumference, had from a 26% increased risk to double the risk of breast or colorectal cancer, and increased cancer mortality compared with individuals who were metabolically healthy.[14-16]

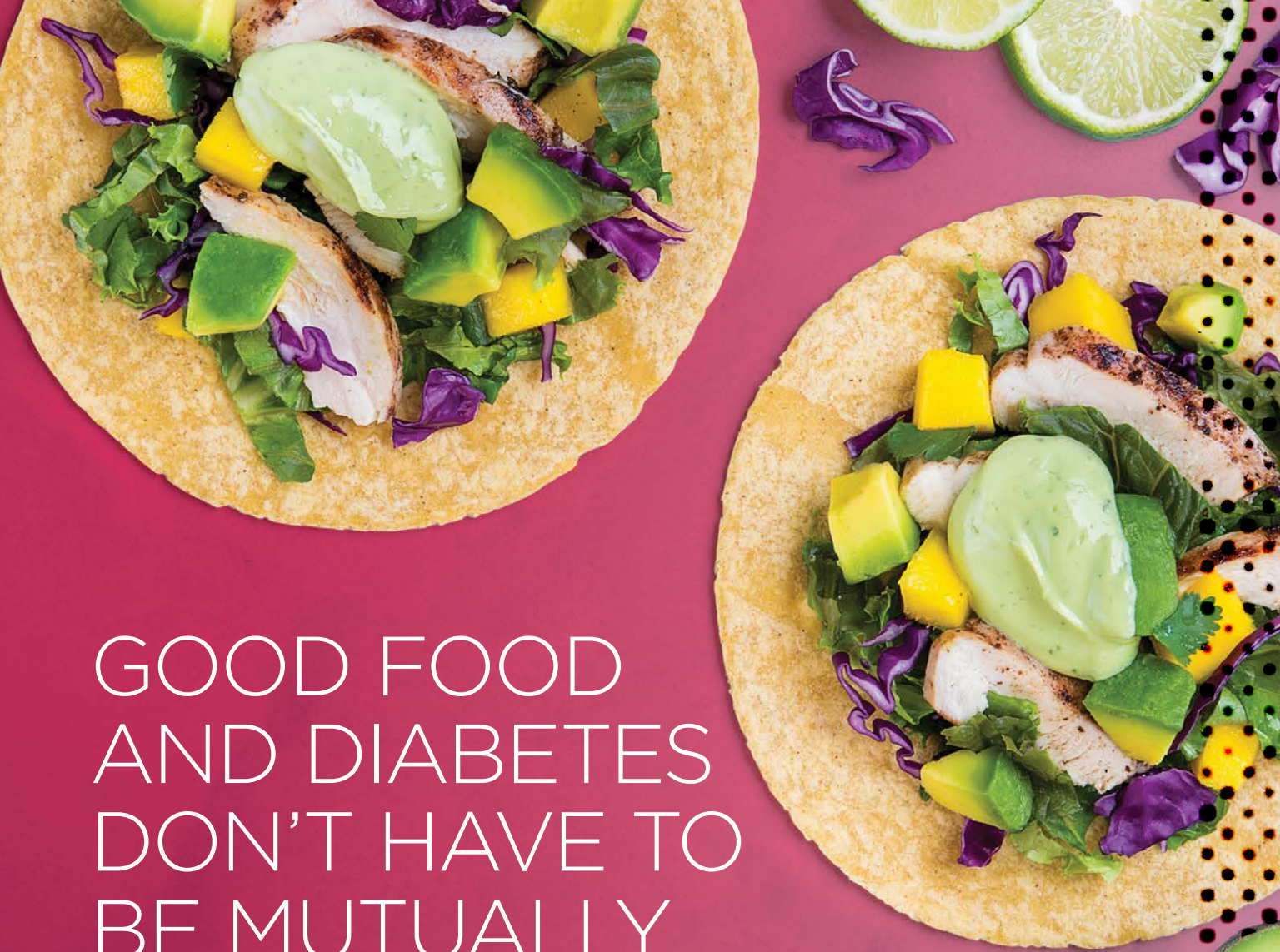
Mechanisms of Risk

Two key factors in the association of metabolic syndrome with risk and outcomes of cancer are chronic inflammation and insulin resistance.

Inflammation

As adipose tissue outgrows its blood supply, it becomes dysfunctional with immune cell infiltration and chronic low-grade inflammation. Inflammation in this microenvironment—the environment immediately around an adipose tissue cell—triggers signaling pathways and gene expression that promote tumor growth and abnormal physiological changes.[6,17] Inflammation enhances production of free radicals that can damage DNA, leading to changes in genes that regulate cell survival and proliferation and cancer progression.[10]

Inflammation in breast adipose tissue can increase aromatase enzymes, resulting in increased synthesis of estrogen that can promote estrogen-sensitive cancers. In men, cytokines produced by inflamed adipose tissue activate androgen receptors, promoting prostate cancer cell proliferation and survival. And local inflammation can stimulate systemic inflammation throughout the body.[6]



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Insulin Resistance

As adipose tissue capacity to take up and store fatty acids is exceeded, the resulting ectopic fat deposition promotes insulin resistance. Insulin's ability to inhibit liver glucose production and stimulate glucose uptake by muscle and adipose cells is impaired. Yet normal or near-normal blood sugar levels can be maintained as long as the pancreas can increase insulin secretion.

Insulin resistance doesn't inhibit insulin's role in the mitogenic signaling pathway that promotes cell proliferation. Increased insulin production to overcome insulin resistance exaggerates activation of this pathway and increases liver synthesis of insulinlike growth factor-1. The result is enhanced signaling for tumor growth.[4,10,17]

Fortunately, research shows that adipose inflammation is a reversible process.[6] An important question is whether addressing metabolic syndrome can reduce risk and improve outcomes of common cancers.

Implications for Practice

Identifying and supporting diet and lifestyle changes that can improve component risk factors is firstline treatment for metabolic syndrome. Now, studies such as those cited earlier suggest that attention to the pathophysiology signaled by metabolic syndrome means that these steps may play a valuable role in reducing cancer risk. Dietitians can accomplish all of this with the following three strategies.

Advocate Healthful Dietary Patterns

Current debates about the optimal amount of dietary carbohydrate can obscure a clearer conclusion from research about the importance of the quality of carbohydrate-containing food choices. Studies comparing high vs low carbohydrate need to be evaluated carefully: When food selection isn't controlled, high-carbohydrate diets typically are high in sugars and refined carbohydrates.

Overall dietary patterns, such as a Mediterranean diet or DASH-style pattern, categorized as healthful based on various scoring systems are linked with lower risk of metabolic syndrome and also fit recommendations to reduce cancer risk.[18-20] Although these healthful dietary patterns differ, several of their characteristics such as the following are relatively consistent.

Criteria for the Harmonized Definition of Metabolic Syndrome[3]

Risk Factor	Level That Meets Criteria
Blood pressure*	Systolic ≥130 mm Hg or diastolic ≥85 mm Hg
Fasting plasma glucose*	≥100 mg/dL
Serum triglycerides*	≥150 mg/dL
HDL cholesterol*	Men <40 mg/dL Women <50 mg/dL
Waist circumference	Population-specific thresholds internationally In the United States[1] • **For people of most ancestries** Men ≥40 inches (>102 cm) Women ≥35 inches (≥88 cm) • **For people of Asian ancestry**** Men ≥35 inches (≥90 cm) Women ≥31.5 inches (≥80 cm)

METABOLIC SYNDROME IS DEFINED BY THE PRESENCE OF ANY THREE OF THE FIVE RISK FACTORS.

* BLOOD SUGAR, BLOOD PRESSURE, OR LIPIDS PREVIOUSLY ABNORMAL BUT CONTROLLED BY MEDICATIONS STILL "COUNTS" FOR MEETING THESE CRITERIA.

** THE LOWER CUT-POINT FOR WAIST CIRCUMFERENCE IS BASED ON GREATER VISCERAL ADIPOSITY AT ANY SPECIFIC WAIST CIRCUMFERENCE MEASUREMENT, PARTICULARLY AMONG SOUTH ASIANS COMPARED WITH EUROPEANS. WORK IS IN PROGRESS TO IDENTIFY ADDITIONAL ETHNICITY-BASED WAIST CIRCUMFERENCE CRITERIA.

• **Dietary fiber** is associated with lower risk of metabolic syndrome in many, but not all, studies.[21] Physiological effects of fibers vary in viscosity, fermentability, and bulking ability, which may explain some variation in these studies (see "Fiber: Increase Amount and Variety" in the July 2018 issue of *Today's Dietitian*). For reduction of inflammation and insulin resistance, foods that supply viscous and fermentable fibers are most likely to be beneficial.[22,23]

• **Fruits and vegetables** provide more than dietary fiber, as their nutrients and phytocompounds support antioxidant defenses and anti-inflammatory pathways. Greater consumption is linked with lower risk of metabolic syndrome in observational studies.[24] Among components of metabolic syndrome, they're strongly linked with reducing elevated blood pressure. Moreover, fruits and vegetables are low in calorie density and therefore may help avoid weight gain that can trigger metabolic syndrome and promote obesity-related cancers.[25]

• **Pulses, whole grains, and nuts** also contribute unique nutrients, phytocompounds, and gut microbiota support that add to the protection against metabolic syndrome seen in Mediterranean and other plant-forward eating patterns.

• **Fish consumption** is associated with lower risk of metabolic syndrome in prospective cohort studies.[26] This may reflect influence of increased omega-3 fatty acid consumption, and also may be a marker of an overall healthful dietary pattern.

There are many different ways to create this kind of eating pattern and show potential to promote overall metabolic health. When linking metabolic health with lower cancer risk, the New American Plate approach, developed by the American Institute for Cancer Research, can be helpful to connect the dots.

Troubleshoot Western Dietary Patterns

Diets high in sweets, refined grains, sugar-sweetened beverages, and red and processed meats are associated with greater risk of metabolic syndrome.[18]

• **Sugar-sweetened beverages** are linked with greater incidence of metabolic syndrome, in some cases even independent of total daily calorie intake.[27]

• **Ultraprocessed foods** may contribute to metabolic syndrome through effects on hypertension and weight gain and waist

circumference. In a cross-sectional analysis of NHANES participants, after adjusting for confounding variables, people with highest consumption of ultraprocessed foods (>71% of calories) had 28% higher prevalence of metabolic syndrome than people who consumed <40% of calories from ultraprocessed foods.[28]

Encourage Lifestyle Changes

• **Seek small wins to avoid weight gain.** As noted, metabolic syndrome is strongly linked to adiposity, especially excess visceral fat. A large prospective cohort study found that weight gain of 5% or more over nine years of follow-up was associated with increased development of metabolic syndrome among normal-weight adults.[29]

• **Promote daily physical activity and separate it from weight.** Even with no change in weight, regular physical activity can help avoid unhealthful elevations of insulin and reduce inflammation. People who get regular physical activity are less likely to develop metabolic syndrome. And getting more than the general recommendation of 150 minutes of moderate activity per week reduces risk even further.[30]

In a clinical trial involving breast cancer survivors who were sedentary or had overweight or obesity, a program that combined moderate to vigorous aerobic activity and resistance exercise successfully reduced metabolic syndrome and improved biomarkers related to metabolic syndrome and cancer.[31]

• **Support sleep habits.** Emerging evidence associates lack of adequate sleep (generally less than seven hours per night on a regular basis) with increased markers of inflammation and insulin resistance. Sleep deprivation and late waking hours may contribute to metabolic syndrome through effects on eating habits and circadian rhythm disruption.[32]

Communicating Essential Messages

Many members of the public are unfamiliar with the concept of metabolic syndrome,[1] and many misunderstandings remain about diet and other lifestyle choices that can reduce cancer risk and improve outcomes for cancer survivors. This provides a valuable opportunity for dietitians to discuss unifying concepts about eating patterns that promote good health.

With regard to metabolic health, discussing insulin resistance provides a chance to clarify that normal blood sugar doesn't guarantee absence of underlying harm. Individual factors such as blood sugar numbers and blood pressure readings are more than "just a number." Especially when considered together, they provide a big picture view of health.

Overweight and obesity, assessed by weight and BMI, identify people at greater risk of cancer (and other chronic diseases), but these are imperfect tools. Maintaining an individually healthy weight can reduce the metabolic effects that unhealthful amounts and types of body fat produce. And aiming for eating patterns, physical activity, and lifestyle habits that support metabolic health provides a path likely to reduce cancer risk while promoting overall health. ■

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For references, view this article on our website at www.TodaysDietitian.com.

Nutrition and Glaucoma Risk

While traditionally thought to have limited or no role in glaucoma prevention and treatment, dietary interventions for the disease are garnering interest and propelling new research.

Glaucoma is a progressive optic neuropathy characterized by degeneration of the retinal neurons that receive visual information from photoreceptors. Affecting more than 3 million Americans, it's a leading cause of irreversible blindness.[1]

Glaucoma occurs when the eye can't drain intraocular fluid effectively, resulting in elevated intraocular pressure (IOP), the most significant risk factor for the disease.[2] Because glaucoma develops slowly, there typically are no detectable symptoms in its early stages. Thus, an estimated one-half of Americans with glaucoma are unaware of their condition.[1]

Reducing IOP has been the standard treatment for glaucoma and usually is done so through medications, laser therapy, or surgery. Previously, lifestyle interventions, including nutrition, appeared to have little influence on glaucoma management. However, complementary and alternative medicine targeting IOP recently has gained attention among both the medical community and consumers. RDs should be prepared to meet with glaucoma patients who seek information about any dietary influence on disease progression.

This research update investigates the potential for nutrition to affect IOP and the incidence and progression of glaucoma.

Diet Composition

As oxidative stress is one reported factor in the pathophysiology of glaucoma, much of the research on diet and glaucoma has focused on nutrients with antioxidant activity.[3]

Fruits and vegetables contain a plethora of antioxidant nutrients hypothesized to decrease risk of developing glaucoma. Identifying a single protective source can be difficult due to a wide and varied nutrient composition of different plant foods. Yet, in one study, women who consumed a diet rich in vitamin A, carotenes, and vitamin C were found to have a decreased risk of glaucoma.[2] High dietary nitrate intake, primarily from green leafy vegetables, also has been associated with a lower risk of developing the disease.[4]

But there's far from a consensus. The Nurses' Health Study and the Health Professionals Follow-up Study found no significant associations between antioxidant nutrients and glaucoma.[3] In other research, lower systemic antioxidant capacity was associated with more severe visual damage in glaucoma, explained in part by its roles in elevating IOP.[5]

A recent cross-sectional study investigated possible associations of nutrients on glaucoma. Diet intake was collected using a food-frequency questionnaire from almost 600 Japanese Americans living in Los Angeles, who also were screened for optic discs indicative of glaucoma. Results demonstrated that low intakes of vitamin A and vegetable fat (omega-6 fats) and a high intake of iron were significantly associated with glaucoma risk.[6] In other research, high iron and calcium intakes

were associated with a greater risk of developing glaucoma.[7]

Magnesium is thought to have a potential role in the treatment of glaucoma. The mineral acts as a natural physiologic calcium channel blocker, improving ocular blood flow and reducing oxidative stress.[6] It's demonstrated improvement in ocular blood flow and prevention of retinal cell loss; more research may help to determine any possible efficacy for glaucoma management.[8]

In both healthy individuals and patients with glaucoma, alcohol consumption has been shown to lower IOP in the very short term, possibly due to alcohol's hyperosmotic effect (the same effect as hyperosmotic agents, which are medications often prescribed to reduce IOP). In addition, alcohol has been shown to increase blood flow to the optic nerve head, which provides a protective effect from glaucoma.[2] The precise amount of alcohol intake for a protective factor isn't yet determined, but limiting alcohol to one drink per day for women and two drinks per day for men is important for overall health.

Coffee, a rich source of biologically active caffeine, has been associated with an increase in IOP.[2] The association is assumed to be secondary to a caffeine-induced increase in homocysteine levels, which are thought to trigger stimulation of basement membrane material (ie, the layer attached to the epithelium, the cornea's most outermost layer).[9]

While tea generally contains much less caffeine than coffee, it's a rich source of flavonoids—major polyphenols in tea—shown to have a protective effect against glaucoma by reducing oxidative stress and improving blood flow.[2] Recently, a cross-sectional report from the National Health and Nutrition Examination Survey on the association between glaucoma and commonly consumed beverages demonstrated that people who consume at least one cup of hot tea daily are less likely to have glaucoma compared with non–tea drinkers. While coffee also contains polyphenols, there was no significant association between coffee and glaucoma risk in this study.[10]

Dark chocolate is another rich source of flavonoid polyphenols that's suggested to be beneficial in patients with certain CVDs, though it hasn't been shown to decrease oxidative stress in glaucoma.[2]

Calories and Weight

Greater BMI, a major anthropometric indicator of obesity, has been associated with higher IOP in observational research, although the mechanism of action is unclear.[11,12] In contrast, epidemiologic studies have demonstrated mixed results.[13] Because BMI doesn't differentiate between fat and muscle composition, the influence of other obesity markers (eg, waist circumference, total body fat mass, percent body fat) were considered and found to have a positive linear relationship with IOP.[11,14]

Metabolic syndrome—the cluster of hypertension, hyperglycemia, and hyperlipidemia—also has been linked to increased IOP and glaucoma.[15]

Dietary Patterns

The ketogenic diet, which has become substantially popular for weight loss in the past few years, may have some utility in glaucoma. After feeding mice a fat-rich (90% fat) diet for eight weeks, researchers found the mice to have higher energy and increased antioxidant levels, and showed less deterioration in their optic nerves. Of course, these results may not be reproducible in humans. Questions also remain as to the safety and sustainability of long-term use of the ketogenic diet.[16]

Diets that focus on plant foods, specifically those that contain vitamins A and C and carotenes, along with nitrate-containing green leafy vegetables, can support adequate polyphenol and antioxidant intake to help prevent glaucoma. Plant-based and Mediterranean-type diets would provide these nutrients. These diets also are in line with consuming adequate omega-6 vegetable oils balanced with omega-3 fats. Omega-3 fatty acids are beneficial for glaucoma patients, as they decrease IOP.[17]

Dietary Supplements

The benefit of dietary supplements is well established for patients with age-related macular degeneration, but there doesn't appear to be much evidence to support their use in glaucoma. Currently, there's no convincing data that supplementation can help prevent or treat glaucoma.[18] People may choose to take a standard multivitamin, but those touted as specific "eye" supplements aren't recommended.[2]

Ginkgo biloba extract (GBE) has a variety of pharmacologic properties considered in the pathogenesis of glaucoma. Current evidence suggests GBE increases ocular blood flow and protects against oxidative stress.[19] More research is needed to confirm these results. In addition, it's imperative to identify therapeutic purity and dosage of GBE or any supplement, as there's no regulatory standardization for supplements in the United States.

Practice Points

Most of the current body of research on diet and glaucoma demonstrates the influence of nutrition on reducing risk of the disease rather than having a significant therapeutic effect. Although there still appears to be much to learn about the diet-glaucoma relationship, good nutrition may help complement glaucoma therapies. It makes practice sense to encourage clients and patients, with or without established glaucoma, to consume fruits and vegetables high in antioxidants and moderate their intake of coffee and alcohol. This is especially warranted because one-half of all those with glaucoma don't know they have it.

Nutrition therapies should continue to include adequate intake of omega-6 vegetable oils in a healthful balance with omega-3 fats for their association in reducing glaucoma risk. Therefore, a Mediterranean diet high in plant foods, which has proven health benefits for those at risk of or being treated for CVD, diabetes, and certain cancers, is recommended.

The Bright Focus Foundation, which funds innovative scientific research for mind and eye health, offers a Healthy Living Disease Toolkit for Glaucoma with specific food recommendations, such as dark green, yellow, and orange fruits and vegetables, that RDs can provide to clients and patients.[18] Finally, in addition to eating a diet high in antioxidants, maintaining a healthy body weight and partaking in regular physical activity also are essential for managing risk and treatment of most diseases, including glaucoma. ■

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For references, view this article on our website at www.TodaysDietitian.com.

Can Dietary Supplements Help Treat Type 2 Diabetes?

Dietary supplements are advertised to treat practically every disease known to man, many with little to no evidence of benefit. For example, diabetes is a common disease treated by supplementing with herbals, vitamins, minerals, fatty acids, and several other less familiar compounds. As of 2018, approximately 1 out of every 10 Americans was thought to have type 2 diabetes.[1] That's 33 million Americans looking for something to improve their condition. Another 88 million, or 1 in 3, have prediabetes, where blood sugar levels are higher than normal, but not yet high enough to be diagnosed with type 2 diabetes.[2]

While there are many supplements promoted to alleviate type 2 diabetes and its associated health complications, few have been studied extensively, results are decidedly mixed, and some are more commonly used than others. But not everyone is on board with treating diabetes with supplements.

"Supplements are largely unregulated, and the benefits are unclear," says Jill Weisenberger, MS, RDN, CDE, CHWC, FAND, owner of Food & Nutrition Solutions by Jill, based in Newport News, Virginia.

When *Today's Dietitian* spoke with Toby Smithson, MS, RDN, LD, CDCES, FAND, a certified diabetes educator and founder of DiabetesEveryDay.com, she said, "Ironically, one of my patients asked me yesterday if there were any supplements she could take to keep her blood glucose down."

Smithson's position aligns with Weisenberger's (she doesn't recommend supplements as a treatment for diabetes). Nevertheless, supplements still are widely used to help prevent or treat type 2 diabetes.

What follows is insight into some of the research conducted on five of the most commonly used and studied supplements positioned as treatments for type 2 diabetes.

Alpha-Lipoic Acid (ALA)

A sulfur-containing acid compound that occurs naturally in both plants and humans, ALA acts as an antioxidant. It also functions as an essential part of energy and amino acid metabolism.[3] ALA supplements have been used to boost the body's ability to use the insulin it produces normally to lower blood sugar in people with type 2 diabetes.

A 2014 study in mice found that giving 100 or 200 mg/kg per day of ALA, while on a high-fat diet, resulted in significantly reduced hyperglycemia and insulin resistance, similar to when mice were given the oral diabetes medication metformin.[4]

In a small study, 12 subjects with obesity and type 2 diabetes (average age 53) were given 600 mg ALA twice a day for four weeks and were compared with 12 subjects with normal glucose tolerance not given the supplement. Supplementation with oral ALA increased peripheral insulin sensitivity in the subjects with type 2 diabetes.[5] In a recent systematic review and meta-analysis of studies on ALA supplementation, three studies examined postprandial blood glucose in subjects with uncomplicated diabetes and found no difference between the supplemented and unsupplemented groups.[6]

ALA also has been used as a treatment for diabetic neuropathy, nerve damage that occurs in over 50% of patients with diabetes, most often in the legs and feet, as a result of high blood sugar levels. A four-month study of 20 patients with type 2 diabetes, some with good glycemic management and some with poor glycemic management, found that ALA was significantly more effective at alleviating diabetic neuropathy symptoms in those with good glycemic control. In the study, ALA was given as an infusion of 600 mg for 21 days, 600 mg was taken orally for three months, and a maintenance dose of 300 mg per day was prescribed.[7]

Both animal and human studies suggest ALA supplements may reduce cardiovascular risk factors in type 2 diabetes, possibly by reducing oxidative stress.[8-10] Human studies found 600 mg per day to improve systemic inflammation.

Chromium

A 2020 study found that serum chromium levels were lower in patients with type 2 diabetes who had higher serum glucose levels.[11] Data from the 2012 National

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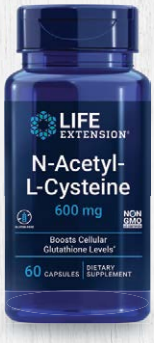

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Health and Nutrition Examination Survey (NHANES) showed that the odds of having type 2 diabetes were lower in those who took supplements containing chromium.[12] But surveys such as NHANES don't prove cause and effect.

However, the evidence for chromium supplements and type 2 diabetes is decidedly mixed. A 2016 review of 14 randomized controlled studies found that the source of chromium determined whether the mineral lowered fasting plasma glucose. Doses varied greatly among the studies, making comparisons difficult. Nevertheless, compared with controls, chromium chloride, chromium yeast, and chromium picolinate (the most common form found in supplements) showed no effect. On the other hand, brewer's yeast, which is rich in chromium, showed a statistically significant decrease in fasting plasma glucose.[13]

A pooled analysis of 28 studies suggested that chromium supplementation with chromium chloride and chromium picolinate reduced fasting plasma glucose, HbA1c, and triglycerides in subjects with type 2 diabetes.[14] Again, dosing varied, making conclusions difficult. However, the authors suggested that chromium supplementation might be a candidate as an adjunct to pharmacological management in patients with type 2 diabetes.

A systematic review and meta-analysis of 22 studies of chromium supplementation found that supplementation of more than 200 mcg per day improved glycemic control. Supplementation also improved triglycerides and HDL cholesterol levels.[15]

An earlier review of 20 randomized controlled trials of chromium supplementation in patients with type 2 diabetes concluded that the existing evidence at that time showed limited efficacy and that there was little rationale to recommend chromium supplements for glycemic control in patients with type 2 diabetes.[16]

Data on combination supplements that contain chromium is limited and inconclusive. However, one four-month study of 62 subjects with elevated fasting blood glucose who received a dietary supplement containing chromium, cinnamon, and carnosine found that subjects with overweight and obesity experienced decreased fasting plasma glucose and increased fat-free mass.[17] The researchers suggested that the combination supplement might be helpful in the prevention of diabetes.

Cinnamon

Cinnamon has been used for centuries both as a spice and as a remedy for a wide variety of medical conditions, including bronchitis, gastrointestinal problems, loss of appetite, and diabetes.[18] However, it's promoted most widely for treating type 2 diabetes. Several studies have been conducted giving cinnamon supplements to mice with diabetes or to people with type 2 diabetes.

But while some studies show cinnamon's benefit for reducing fasting blood glucose when used in addition to changes in diet and lifestyle—and sometimes in addition to hypoglycemic medications—most human studies have demonstrated only modest improvements, if any at all.

> ***"There is almost nothing in nutrition where there is clear evidence of benefit—unless it's a deficiency disease—and these supplements are no exception. When you first hear the information [about supplements], you should think, 'That's interesting,' rather than make an immediate decision."***
>
> ***— Jim Painter, PhD, RDN***

In 2004, one study demonstrated that cinnamon extract lowered blood glucose in mice with diabetes in a dose-dependent manner when given extremely high doses (200 mg/kg had the greatest effect).[19]

Most studies using cinnamon have been conducted overseas. However, in 2007, the first US study to evaluate the effects of cinnamon on blood glucose in patients with type 2 diabetes found that cinnamon taken at a dose of 1 g per day for three months produced no significant changes in fasting glucose in 30 subjects taking the supplement.[20]

In a recent randomized controlled trial, researchers gave 140 patients with type 2 diabetes either cinnamon bark powder (500 mg) or a placebo twice a day for three months.[21] While researchers saw improvements in fasting plasma glucose, improvements were significantly greater in patients with a higher baseline BMI (27 kg/m^2). In an earlier randomized controlled study, 105 patients with type 2 diabetes who were given 1 g of cinnamon per day for 90 days saw improvement in fasting blood glucose.[22]

Several review papers and meta-analyses have been published, providing mixed conclusions.[23-25] One recent meta-analysis of 16 randomized controlled studies found that cinnamon supplements reduced fasting blood glucose in patients with type 2 diabetes and those with prediabetes compared with placebo. However, the researchers emphasized that the studies varied considerably regarding the type of subjects included, the length of the studies, whether the subjects took oral medications, and the dosages of the cinnamon supplement.[26] Moreover, there are many types of cinnamon, a factor seldom identified in studies that could affect outcomes.[18]

Fenugreek

Fenugreek has a long history of medical use in Ayurvedic and Chinese medicine. Recently, preliminary animal and human trials suggest it has the potential to lower blood sugar levels. A meta-analysis of 10 such studies examining the effect of fenugreek on glycemia found that fenugreek seeds (about 5 g/day) significantly reduced fasting blood glucose, two-hour glucose, and HbA1c.[27]

In one study, researchers gave 10 g of fenugreek seeds daily for six months to 60 patients with type 2 diabetes who were taking either insulin or oral hypoglycemic agents as they followed a prescribed diet and regular exercise. The researchers found that by the fourth month there was a synergistic effect of diet, exercise, and fenugreek, resulting in a trend toward reduced fasting blood glucose and HbA1c, although the downward trend wasn't significant.[28]

Research also has suggested that fenugreek may help delay or prevent diabetes from developing initially. A three-year randomized controlled trial found that supplementing with 10 g fenugreek per

day reduced the conversion of prediabetes to diabetes among 66 subjects. The control group with prediabetes had a 4.2 times higher risk of developing diabetes during the study compared with those taking fenugreek supplements.[29]

Animal studies suggest that fenugreek seed may work to aid diabetes in several ways, including slowing digestion of carbohydrates, reducing gastrointestinal absorption of glucose, and stimulating glucose uptake in peripheral tissues.[30]

While there have been several human trials conducted to test the efficacy of fenugreek in type 2 diabetes, most haven't been well controlled, were short-term, or involved small numbers of subjects.

Berberine

Berberine is the active component of an ancient Chinese herb used to treat diabetes.[31] According to Jim Painter, PhD, RDN, emeritus professor at Eastern Illinois University in Charleston, Illinois, "There are an amazing number of clinical trials with berberine, but they are usually small."

A systematic review and meta-analysis of 14 studies concluded that berberine exhibited efficacy comparable to that of conventional oral hypoglycemic agents.[32] However, doses given to subjects varied among the studies and the authors of the study emphasized that the quality of the studies was low, making it difficult to develop recommendations for berberine.

Berberine also has been shown to lessen oxidative stress and inflammation, both of which can result from diabetes and that can worsen the progression and complications of the disease.[33]

Despite the findings, Barbie Cervoni, MS, RD, CDCES, CDN, former advanced nutrition coordinator for the diabetes alliance at Mount Sinai Diabetes and Cardiovascular Alliance in New York, says, "It's important for people to understand that taking a supplement does not replace a medication and that too much can cause adverse side effects."

Bottom Line

Given the lack of conclusive evidence from randomized controlled trials, controversy lingers regarding the potential benefits or risks of any one dietary supplement to prevent the development of type 2 diabetes or to help manage blood glucose levels. In fact, the American Diabetes Association says, "There is insufficient evidence to support the routine use of herbals and micronutrients, such as cinnamon, curcumin, vitamin D, or chromium, to improve glycemia in people with diabetes."

When Painter was asked whether he supported the ADA's recommendation not to take supplements for diabetes, he said, "They're not wrong, just conservative. There is almost nothing in nutrition where there is clear evidence of benefit—unless it's a deficiency disease—and these supplements are no exception. When you first hear the information [about supplements], you should think, 'That's interesting,' rather than make an immediate decision."

Painter recommends dietitians do their own digging and find out whether positive study findings have been reproducible in the general public. ■

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Ethics *in the* Plant-Based Food Movement

BY **SHARON PALMER, MSFS, RDN**

The plant-based—in particular the vegan—movement is heating up.

While the Vegetarian Resource Group survey finds that only about 2% of the US population is vegan,[1] one trend report shows a 600% growth in veganism, from 1% to 6%, between 2014 and 2017.[2] The roots of plant-based eating have been intertwined with food traditions throughout history, as these eating practices were part of beliefs surrounding religious faiths, health, and ethics in many cultures. Today, people are attracted to this lifestyle for similar reasons, which are well documented by science, including health benefits,[3] lower carbon footprint,[4] and reduced animal suffering.[5]

However, there are several ethical concerns surrounding the plant-based movement, which largely has been embraced by higher-income, well-educated, white populations, often leaving Black, Indigenous, and people of color (BIPOC) and those less educated and more food insecure out of the conversation.[5,6]

"Plant-based eating has grown in popularity over the years, with people being drawn to plant-based for climate, health, and animal rights [reasons]," says Los Angeles–based dietitian Sherene Chou, MS, RD, past chair of the Vegetarian Nutrition Dietetic Practice Group of the Academy of Nutrition and Dietetics (the Academy). "Even though the movement stems from Jainism and Buddhism, along with plant foods being celebrated around the world, it is seen as a largely wealthy, white, elitist movement in the United States. This is largely due to traditional flavors and cultural foods being exoticized, discovered, appropriated, and repackaged as something new for white consumers, while leaving history and BIPOC out of the mainstream conversations."

To be sure, the plant-based eating style is a positive diet philosophy that has the power to bring about beneficial changes within the food system, such as reduced carbon footprint, health benefits, and improved animal welfare.[3] However, there are many opportunities to address racial, ethnic, and cultural inclusivity within the plant-based food movement to promote a more fair, successful lifestyle.

Today's Dietitian **speaks with African American and other dietitians of color about racial, ethnic, and cultural inequalities within the movement and how nutrition professionals can help transition it into a more inclusive initiative for all.**

The History

Though the plant-based lifestyle may seem like the latest trend, forms of these diets have been around for thousands of years across the planet as part of religious, health, and ethical practices. Ancient cultures, such as in Egypt, China, India, Peru, Mexico, and Greece, upheld plant-based diets. Around 500 BC, Greek philosopher Pythagoras advocated benevolence among all animal species in the form of a vegetarian diet, followed by the Greek philosopher Plato, who told the townspeople to avoid meat for health reasons. Around the same time, the Buddha promoted vegetarian diets among his followers.[7,8]

Indeed, most traditional, indigenous diets that date back through the centuries are based on plant foods. For example, plant-based eating was common within the African diaspora, with a large intake of greens, tubers, grains, nuts, and fruits.

During the Renaissance and the Age of Enlightenment, some philosophers and artists, such as Voltaire and Jean-Jacques Rousseau, rejected the concept of eating animals for ethical reasons. Leonardo da Vinci said, "The time will come when we will condemn the eating of animals, just as today we condemn the eating of our own kind, the consuming of humans."

By the 19th century, things started happening in the United States, with John Harvey Kellogg founding a sanitarium in Battle Creek, Michigan, with the health ideals of a vegetarian diet. Albert Einstein, who became a vegetarian, said, "Nothing will increase the chance of survival for life on Earth as much as the evolution of the vegetarian diet." Today's concept of veganism was established in 1944 with the creation of the Vegan Society.

Frances Moore Lappé, who published the best-selling book *Diet for a Small Planet* in 1971, became a major influencer advocating for the nutritional and environmental benefits of vegetarian diets.[9] About the same time, hippies started embracing the plant-based movement, as vegetarian communes in California turned to tofu and soy for plant protein sources. The health arm of the plant-based movement started growing out of the Loma Linda University School of Public Health,[10] which launched the Adventist Health Studies in 1958, documenting the health benefits of the plant-based lifestyles practiced by Seventh Day Adventists.

Today, plant-based eating has evolved into a vibrant, active community of people embracing this lifestyle across the world. Americans often cite multiple reasons for why they follow this diet, including health, religious practices, animal welfare concerns, and environmental concerns. Surveys show that the leading reason people avoid animal foods is health, with animal welfare also cited as a top reason.[11]

Many organizations help support the growing food movement, including animal welfare organizations that promote meat reduction and/or plant-based eating, such as Mercy for Animals and the Humane Society. Health organizations that specifically advocate for plant-based diets include the Center for Nutrition, Healthy Lifestyle and Disease Prevention; Physicians Committee for Responsible Medicine; and Forks Over Knives. And many environmental organizations promote meat reduction, including the Environmental Working Group, Sierra Club, and National Resources Defense Council.

Dozens of celebrities, from Moby to Beyoncé, are open about their plant-based lifestyles, further promoting the cachet of this diet in the media. Plant-based living basks in the positive support of television shows, documentaries, magazines, books, websites, and apps. There are hundreds of plant-based restaurants in the United States and thousands of vegan products on supermarket shelves, many with Certified Vegan labels. More now than ever, people who follow a plant-based diet find a positive support system, which includes dinner clubs, societies, meetups, and online support groups. However, this support system isn't readily available to everyone.

Ethics in Plant-Based Diets

While the philosophy of plant-based eating addresses the ethical concerns surrounding animal welfare,[12] other less obvious ethical concerns detract from the movement, including food insecurity, class, race, food sovereignty (the right of people to have access to healthful and culturally appropriate food), and cultural foodways (practices related to the production and consumption of food as it relates to culture, traditions, and history). Eating this way has come to suggest a privileged, white, elitist point of view.[5,6] The stereotypical image of a vegan is an upper-class, thin, white woman who shops at Whole Foods while sporting a vegan T-shirt and yoga pants.

"Healthful foods are often seen as a privilege instead of a right, and the plant-based movement is also often showcased in a way that parallels that," says Wendy Castro-Harris, MS, RDN, director of nutrition at Better 4 You Meals in Commerce, California. "For many BIPOC, plant-based eating can feel disconnected from cultural foods due to lack of representation."

Food insecurity is one of the most pressing issues. As one has the financial means to make decisions and have control over one's food choices, only then do options, such as the choice of dietary pattern, become possible. For a low-income family faced with choosing adequate foods to fill their growling bellies, that dollar menu burger at the local fast food restaurant looks much more feasible than a smoothie bowl with $20 worth of trendy ingredients.

Even though plant-based diets benefit animal welfare, provide health benefits, and require less land and resources to produce food than animal-based diets, thus providing a better solution for feeding the growing planet,[3] this eating pattern doesn't help address the food insecurity families may experience in real time. Though it's important to note that recent studies have shown plant-based diets may cost less than meat-rich diets, with a savings of about $750 per year.[13]

"Plant-based diets are a privilege in many communities," Castro-Harris says. "It's a difficult challenge because of systemic racism seen from farming practices all the way to food access. While some believe that BIPOC want to be plagued with chronic diseases and eat fast food every day, that is just not reality."

Racism has been pervasive in our food system, dating back to the dispossession of land from Indigenous populations

and the enslavement of Africans for farm labor through the Jim Crow era when African Americans lost millions of acres of farmland, and is evident in the current predominantly BIPOC farm labor work force, which often is paid poverty wages and experiences high levels of food insecurity.

Issues of race and class are important to consider. In fact, the nature of this white, middle- and high-income movement is in itself a barrier. Proponents of the movement often have been critical of food choices made by BIPOC and those in poor communities, with little regard to the presence of food deserts, proliferation of fast food restaurants, and subsidies that fuel food options provided by WIC, SNAP, and the School Lunch Program.

"While plant-based eating forms the basis of cuisines amongst a variety of cultures, the actual movement promoting plant-based nutrition in the United States was started by organizations within white, middle- to upper-class communities," says Lilian Correa, MPH, RD, a dietitian at the Plant-Based Lifestyle Medicine Clinic in Bellevue, New York. "Coupled with preexistent health disparities, including access to health education within communities of color, this targeted marketing widened the cultural gap."

BIPOC suffer from the impacts of poor nutrition—obesity, heart disease, and type 2 diabetes—disproportionately than their white peers. However, there's a growing, dynamic plant-based movement among BIPOC, evidenced by the group Vegan Voices of Color and the 2017 documentary *The Invisible Vegan* (theinvisiblevegan.com), which features BIPOC who explore how race and class intersect within the movement.

"The younger generations, in general, including POC, seem to be gaining interest in the ethical and health benefits side of the vegan diet," says Kaelyn Johnson, MPH, RD, a renal dietitian working in Torrance, California. "With various documentaries being available, more people in communities that felt wary or not included in the plant-based movement are starting to see its benefits for themselves, the animals, and the environment."

Honoring cultural foodways and considering food sovereignty is another important challenge within the plant-based movement. People should have the right to consume healthful, sustainable foods that are culturally appropriate. Thus, a one-size-fits-all plant-based diet with tofu, soymilk, and radish sprouts may not suit the cultural diet preferences of someone who grew up in Argentina eating red meat every day. It's important to consider that certain foods may be unfamiliar (and even disgusting) to some people, eating patterns are an evolution of cultural and religious traditions handed down over the centuries, and various cultures may view animal ethics in entirely different ways.[5,6]

At the same time, plant-based foods have had a rich place in food cultures across the planet. "Food culture absolutely enhances links to plant-based eating," says Morgan P. McGhee, MPH, RD, director of school nutrition leadership at FoodCorps. "If we know our history, plant-based foods were a cornerstone in the diet of enslaved Africans; whether it's black-eyed peas, okra,

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or watermelon, the food consumed by ancestors is alive and well in the culture today. Unfortunately, through colonial rhetoric, many have fallen into the belief that many ancestral foods are 'bad' or 'unhealthy,' which leads an individual, such as a child, to think that they are then 'unhealthy' or 'bad.' Once we start to truly understand our cultural foodways, we can decolonize our diets and perhaps move to a more plant-forward way of eating."

"Plant foods have always been a major staple of all BIPOC cultures," Castro-Harris says. "For the black community, the centuries of enslavement were a time when enslaved peoples only got food scraps. Because they were creative and resilient, they turned those scraps into beautiful and delicious Southern dishes that are still cherished today. However, those meals weren't traditional dishes to Africa. Traditional African diets, though varied by country, are rich in plant foods like tubers, maize, and beans. For the Latinx and Asian communities, being immigrants in this country has resulted in a lot of our communities assimilating to American culture to belong, and eating the 'American diet.' The recent growth in the plant-based movement among BIPOC is our people finally deciding to take back what was taken from us—the liberation to eat healthful foods that sustain us and increase our longevity. For many BIPOC, it's a road to liberation."

Recommendations for Fairness

The growing plant-based movement can be more vibrant and successful by creating a fair, just initiative, accounting for issues such as food security, nutrition, science, innovation, cultural foodways, diversity, and community. This is a complicated issue that involves food policy action to ensure that communities have access to healthful plant-based foods through the availability of farmers' markets, community-supported agriculture, and supermarkets that provide healthful plant-based foods, as well as food assistance programs, such as WIC, SNAP, and school programs.

More images and stories of people of color need to be shared. Communities need to offer culturally specific support groups and meet-ups to promote healthful eating. Educators need to address the ways that culturally significant foods can fit into plant-based patterns. And most importantly, dietitians need to dig into the indigenous plant-based roots of cultures, such as in Africa, Asia, and Central America, to help make healthful eating compelling to all. For example, learning the traditions of eating wild greens in West Africa, tofu in Asia, and the three sisters (beans, squash, and maize) in Central America can inspire pride and interest among people from these cultural backgrounds.

"It's important to note that access alone doesn't change food selection; we, as dietitians, have to advocate for policy change to increase funding for farmers of color, funding for further farm-to-school and gardening grant opportunities, and for relevant community nutrition education," Castro-Harris says. "Most importantly, we must also be willing to enter communities, asking them what their needs and goals are and how plant-based eating fits into that."

Correa says, "We can learn to listen to our patients more, and be curiously engaged with their culture and traditions. When patients share the ingredients in their kitchens, the foods they grew up with, and foods of their cultures, we often find the answers we were looking for right in the conversation. In addition, we can also get into the kitchen ourselves and try out new recipes from different cultures, or go to restaurants with an aim to explore various cuisines. Such experiential learning better equips us to suggest substitutions, if necessary, that will be familiar or similar in texture and flavor while providing healthier options for patients."

Castro-Harris says, "Food is rooted in our familial and cultural traditions, so as dietitians, it is our job to listen and learn from the communities we work in and with. It's important for us to not try to erase their cultures by asking them to conform to Eurocentric diets. This is a tricky thing, because a majority of dietitians are white, and care needs to be had so that cultural appropriation does not occur."

Castro-Harris offers some helpful suggestions for white dietitians:

- Understand that you're not the expert when it comes to a different community's culture and overall eating pattern.
- Know that all people within a culture aren't a monolith; if working with a Mexican community, don't assume that all Mexicans are alike, let alone eat the same foods.
- Find dietitians who belong to the community or who are of the same ethnicity and race of the community you're working with, and read and listen to what they share. Use search engines to lead you to answers to questions you may have after reading and listening to their content. Be sure to focus on sources created by BIPOC.
- If recreating a recipe, consider whether you're changing it simply to "healthify" it. If so, a more culturally competent approach is to discuss balanced eating with the community so they understand that all foods fit.
- If you're making recipes and need to modify them based on ingredient availability or adding in more veggies (when it makes sense), make sure to use recipes originally shared by BIPOC, and be sure to give them credit.

McGhee says, "Educate yourself and clients on the cultural foodways as told by folks from those cultures. Empower communities through food sovereignty. Agricultural practices are prevalent in many cultures, and food sovereignty can empower communities to define their own sustainable system. As you go on this journey with your client or community, recognize that unless you are a member of that community, you are a guest. This does not mean that you don't ask questions to spark conversations on exploring various preparation methods, seasonings, or more plant-forward alternatives, but if you're truly there to 'serve' the community, you have to do just that on their timeline and in their way." ■

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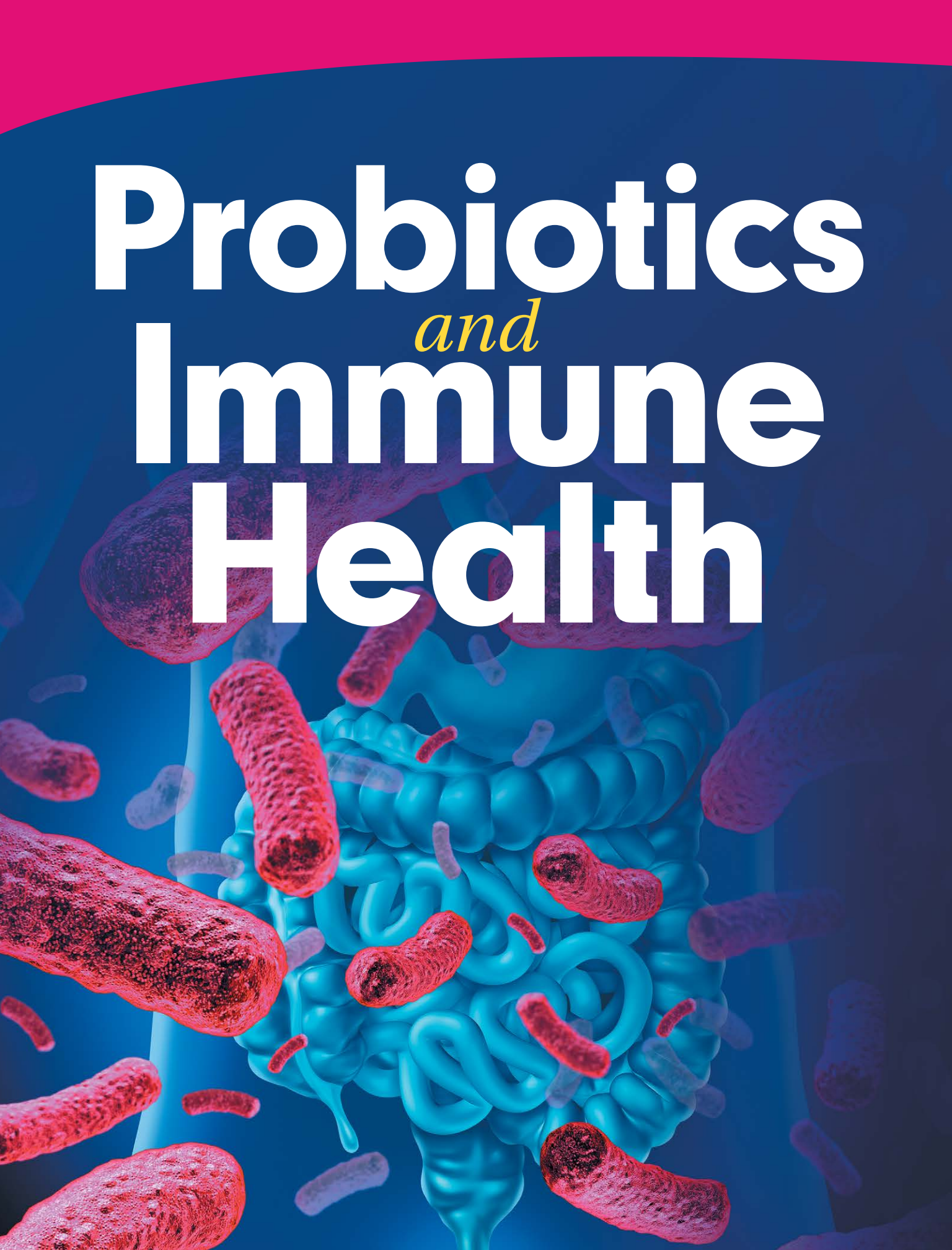

Are we getting ahead of the science?

By
CARRIE DENNETT, MPH, RDN, CD

Research on the role of the gut microbiota in human health is a rapidly evolving area of science. The gastrointestinal tract is the largest interface between us and our external environment, and most of our immune cells reside in the wall of our large intestine. Naturally, this raises questions about the role of probiotics in immune system function.

Probiotics—live microorganisms that, when administered in adequate amounts, confer a health benefit on their host—have been shown to improve aspects of gut health, so it seems like a logical assumption that probiotics can improve our immune health. In fact, there are no shortages of claims stating that probiotics do support immune health, but are those claims supported by science?

Gut Microbiota and Immunity

The human gut microbiota—the population of an estimated 100 trillion microorganisms that live in our intestines—provides us with certain benefits our bodies don't have on their own, including resistance against infection and maturation of our immune systems.[1] It's known that the gut microbiota and the human immune system have a bidirectional relationship: Our gut microbiota develops and regulates our complex immune system, and in return our immune system maintains the symbiotic relationship between us and our microbial community.[1-3]

To maintain this relationship and achieve the balance between immune tolerance and immune stimulation (inflammation) that's key to a healthy, properly functioning immune system, our gut microbes and our immune cells must be able to "talk" to each other. That cross-talk is affected by the health of our intestinal barrier, sometimes referred to as the "mucosal firewall."[1,2]

Intestinal Barrier Integrity

The immune system constructs and maintains the intestinal barrier, which consists of a combination of mucus, intestinal epithelial cells, immunoglobulin A (IgA), antimicrobial peptides, and other immune cells. In addition to facilitating communication between our immune system and microbiota, this barrier helps protect the gut microbiota by keeping it contained in the intestines.[2]

The mucus layer protects the epithelium from digestive enzymes and blocks passage of bacteria—helping to prevent both infectious and inflammatory diseases—while allowing passage of nutrients and fluids. The mucus is mostly made of glycoproteins known as mucins, which are secreted by epithelial cells.[1,4]

Together, the mucus and epithelial layers act as a physical barrier between gut microbes and the lamina propria, a thin layer of connective tissue that houses several immune cells.[1,2,5] The cell-rich lamina propria includes lymphocytes—both T cells and IgA-secreting B cells—macrophages, dendritic cells, mast cells, and various white blood cells, all of which play a role in immune function.[6,7]

Pathogen Response

Our gut microbes support immune health by directly interacting with pathogenic microbes—creating an inhospitable environment for them by various means—or stimulating our immune systems to do the job.[1,2] In turn, a healthy immune system protects the gut microbiota by attacking pathogenic microbes while suppressing inflammatory responses to nonpathogenic foreign substances we ingest, including food.

This is important because inappropriate immune responses to nonpathogenic bacteria or dietary components contribute to several intestinal and autoimmune diseases, including celiac disease, irritable bowel syndrome, inflammatory bowel disease, and food allergies.[1,2,4] The immune cells primarily responsible for suppressing inappropriate immune responses are

regulatory T (Treg) cells, which are generated from both the thymus gland and the gastrointestinal tract.[2]

Short-Chain Fatty Acids

One pathway to Treg production is by way of short-chain fatty acids (SCFAs), which are byproducts of microbial fermentation of carbohydrates. The primary SCFAs are acetate, butyrate, and propionate.

SCFAs lower the pH of the intestine, helping to inhibit the growth of certain pathogenic microbes.[8] While SCFAs are long known to help regulate immunity, more recent evidence has found that they can induce secretion of cytokines and generation of Treg cells in the intestines.[2,9] For example, butyrate directly can decrease secretion of proinflammatory cytokines interleukin 6 and 12 (IL-6 and IL-12) and increase secretion of anti-inflammatory (immunoregulating) cytokine interleukin 10 (IL-10) by dendritic cells. Moreover, both butyrate and propionate can prompt dendritic cells to promote Treg cells.[4]

The ability of gut microbes to indirectly influence dendritic cells is important because dendritic cells also act as messengers between the innate and adaptive immune systems, either by direct contact with immune cells or by release of both proinflammatory and anti-inflammatory cytokines.[4]

Innate immunity is our front-line defense system, responding rapidly to the presence of pathogenic microbes and protecting us from infection. This front line, which includes neutrophils, monocytes, macrophages, and natural killer (NK) cells, isn't specific in recognizing and targeting pathogens. Adaptive immunity, on the other hand, develops more slowly but targets specific pathogens more effectively and has a long-lasting protective memory, enabling better response when pathogens are reencountered.

B and T lymphocyte cells are the primary players in the adaptive immune system. B cells secrete antibodies, and T cells have different roles through their subtypes: T helper cells (T_h or $CD4^+$ cells) and cytotoxic T cells ($CD8^+$).

Probiotics and Immunity

So that's what our endogenous—or native—gut microbes can do for our immune systems. But what about probiotic bacteria and other microbes people ingest through supplements, foods, and beverages?

Similar to endogenous gut microbes, probiotics have been shown to have immunomodulatory properties through direct and indirect pathways. Through direct pathways, probiotics can increase activity of macrophages and NK cells or modulate the secretion of immunoglobulins and cytokines. Through indirect pathways, probiotics can enhance the gut epithelial barrier, alter mucus secretion, and successfully compete with and exclude pathogenic bacteria.[1]

Direct Mechanisms

Similar to endogenous gut microbes, different probiotics can be classified as proinflammatory or anti-inflammatory, according to their capacity to stimulate or regulate immune and nonimmune cells.[10] Ideally, the immune system is stimulated when it needs to fight against pathogens, and regulated when there's no actual threat.

Proinflammatory probiotic species induce IL-12 and NK cell immunity and have the ability to act against infection and cancer cells, as well as against allergies.[7,11,12] Anti-inflammatory probiotics can induce IL-10 and Treg production,[11] which can decrease risk of allergy, inflammatory bowel disease, autoimmune diseases, and other inflammatory responses.[12] By modulating the immune response and inducing the development of Treg cells, probiotics may help preserve intestinal homeostasis.[10]

For example, consumption of a strain of *Bifidobacteria infantis* by healthy human volunteers resulted in an increased proportion of Treg cells in the blood. Consumption of *B infantis* by patients with psoriasis, individuals with chronic fatigue syndrome, and those with ulcerative colitis experienced reduced levels of serum proinflammatory biomarkers such as C-reactive protein, which was possibly mediated by increased numbers of Treg cells.[4]

Certain probiotics, including several species of *Lactobacillus* and *Bifidobacterium*, may influence NK T cells, a group of cells that share characteristics of both T cells and NK cells and play a role in several aspects of immunity. However, the consequences of this in humans are unclear.[4,12] These probiotics may also stimulate production of IgA, IL-10, transforming growth factor beta, and IL-6 in the epithelial cells, mucosa, and/or the lamina propria.[12]

Indirect Mechanisms

The tight junctions between epithelial cells are a key factor in the integrity of the gut barrier. When the proteins that make up the tight junctions become dysregulated, the gut barrier is compromised, and leaky gut may develop.[1,13] Various nutrients can regulate tight junction proteins, and some probiotics may have similar capability.[1] For example, research has shown several specific probiotic strains, including *E coli Nissle* 1917, *B infantis* from a VSL#3 cocktail, and several *Lactobacillus* strains were able to positively alter the regulation of tight junction proteins. Most studies were conducted in animals or lab settings, but *Lactobacillus plantarium* has shown positive effects when tested on human subjects.[1,6]

Specific probiotic bacterial strains, including some from the *Lactobacillus* family, have been shown to regulate mucin expression, and therefore indirectly regulate the immune system by supporting a healthy mucus layer. Most of the supporting studies have been in vitro, with some overlap with the probiotic strains shown to help regulate tight junction proteins. One of these is VSL#3.[1,4]

In addition, certain probiotic microbes can induce metabolism of vitamin A into retinoic acid by dendritic cells—important for immune health—at least in in vitro and animal models, and *Lactobacillus rhamnosus* can induce development of a dendritic enzyme that in turn induces development of mucosal Treg cells.[4]

When human endogenous gut microbes are able to occupy all functional niches in the microbiota, they effectively crowd out any pathogenic bacteria. But when some of these niches are left open, supplementing with probiotics can potentially fill those voids and

prevent or reduce invasion and colonization by pathogenic bacteria.

Probiotics also may alter the intestinal environment by producing SCFAs, lactic acid, bacteriocins (protein-based toxins produced by one bacterial species to inhibit the growth of a closely related bacterial strain), reactive oxygen species (which can regulate T cell immune response), and other metabolites, which could inhibit growth of pathogenic microbes.[11,12] Because select probiotics protect against pathogenic bacteria and help ensure the survival of endogenous microbes, this also has an indirect effect on immune function. Several *Lactobacillus* strains have been identified as having these properties.[1]

Probiotics and COVID-19

While "boosting immunity" was of interest long before the coronavirus pandemic hit, now it's a holy grail. While certain probiotics have been shown to reduce the risk of viral infections, it's important to remember that they haven't been studied specifically for COVID-19 prevention or treatment.

Back in 2005, a randomized, double-blinded, placebo-controlled intervention study supplemented 479 healthy adults aged 18 to 67 with daily vitamin and mineral supplements, with or without specific *lactobacilli* and *bifidobacteria* probiotic strains. After three months, when looking at incidences of the common cold, participants who received the probiotics recovered almost two days sooner, on average, and had reduced severity of symptoms. The probiotic group also had larger increases in $CD8^+$ and $CD4^+$ cells.[14]

A 2015 *Cochrane* review of randomized controlled trials comparing probiotics with placebo to prevent acute upper respiratory tract infections (URTIs) concluded that probiotics were better than placebo in reducing the number of participants experiencing episodes of acute URTI and average duration of an episode of acute URTI, as well as reducing antibiotic use and cold-related school absence. The authors say this suggests probiotics may be more beneficial than placebo for preventing acute URTIs, with the caveat that the quality of the available evidence was low or very low.[15]

Given that some orally administered probiotic strains have been shown to reduce the incidence and severity of viral URTIs, some public health experts are pushing for them to be used with COVID-19 patients, especially since many drugs are being deployed that have little data specific to COVID-19. It also has been suggested that the government should fund probiotic trials as well as drug trials.[16]

However, other experts emphasize that the rationale for using probiotics in COVID-19 is derived from indirect evidence. In a July letter in *The Lancet Gastroenterology and Hepatology*, the authors wrote, "Blind use of conventional probiotics for COVID-19 is not recommended until we have further understanding of the pathogenesis of SARS-CoV-2 and its effect on gut microbiota. It is likely that a novel and more targeted approach to modulation of gut microbiota as one of the therapeutic approaches of COVID-19 and its comorbidities will be necessary."[17]

In a guidance document on the use of probiotics and prebiotics for COVID-19, the board of the International Scientific Association for Probiotics and Prebiotics reiterates that not all evidence that probiotics can reduce the incidence and duration of URTIs is of high quality, and more trials are needed to confirm these findings as well as determine the optimal strain(s), dosing regimens, and time and duration of intervention. "Further, we do not know how relevant these studies are for COVID-19, as the outcomes are for probiotic impact on upper respiratory tract infections, whereas COVID-19 is also a lower respiratory tract infection and inflammatory disease," they wrote. "We reiterate, currently no probiotics or prebiotics have been shown to prevent or treat COVID-19 or inhibit the growth of SARS-CoV-2."[18]

Future Directions

The field of immunology is pivoting away from a lymphoid tissue–centric view of the immune system and increasing research to further understand the role of the microbiota. However, to date most studies on probiotics have focused on the effects on human metabolism, not on human immune response.[12]

While it's clear that gut health plays a major role in immune system function, it's too soon to recommend probiotics as a go-to for enhancing immunity. Research has shown that probiotics have immune system–modulating activity through various mechanisms, yet it's with specific strains, not just with a random off-the-shelf probiotic supplement or brand of yogurt. Demonstrating an effect on immune health requires studies of specific probiotic strains with defined immunological endpoints. If, say, a specific strain of *lactobacilli* is shown to improve immune health, those results can't be extrapolated to other probiotics or strains of microbes in fermented foods that haven't been specifically identified as probiotic.

This is an area where it's easy for consumers, as well as dietitians and other health care providers, to get ahead of the science and take actions or make recommendations that aren't evidence based. While this is an exciting area of science—and one with increased urgency, given the coronavirus pandemic—it's important to be able to articulate to patients and consumers the difference between where the science is and where it may be going.

"The complexity of this issue rests with the fact that to make the claim that probiotics can improve or support immune health, you need to have both mechanistic data, from human studies, and clinical endpoint data," says Mary Ellen Sanders, PhD, owner of Dairy & Food Culture Technologies, a probiotic consulting business in Centennial, Colorado. "There are many studies showing impact on what are considered to be positive immune markers, but unless there is a measurable impact on some meaningful clinical endpoint, who cares? None of us cares if our natural killer cell activity is increased. We care if we aren't as likely to get sick or can get better faster." ■

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Encourage clients to get creative to achieve their nutrition goals.

BY JILL WEISENBERGER, MS, RDN, CDCES, CHWC, FAND

Meeting Weekly Seafood Recommendations

On average, consumers eat only one-third of the recommended amount of seafood. The 2015–2020 Dietary Guidelines for Americans recommends adults eat at least two seafood meals or about 8 oz of seafood weekly. Yet the average fish and shellfish intake is about 2.7 oz per week.

Instead of the recommended 20%, seafood accounts for only about 5% of total consumption from the protein foods group, which consists of meat, poultry, seafood, eggs, legumes, nuts, seeds, and soyfoods.[1] Shrimp, salmon, canned tuna, tilapia, and Alaskan pollock make up about three-fourths of total seafood consumption in the United States. Dietitians can help clients trade other protein foods for a variety of seafood options to better meet goals and diversify their diets.

"Most people aren't enjoying the hundreds of other seafood varieties that are available in the US," says Tim Fitzgerald, senior ocean director at Environmental Defense Fund (edf.org), a leading international nonprofit organization that develops solutions to environmental problems. Part of the reason, Fitzgerald says, is that seafood can be intimidating. "But I'm a firm believer that simple seafood is the best seafood," he adds.

Familiarity also is a factor, says Rima Kleiner, MS, RDN, LDN, owner of Smart Mouth Nutrition and paid blogger and consultant at *Dish on Fish*, a blog where people can find seafood recipes and learn health and nutrition information about seafood. Kleiner says people eat a limited variety because they lack awareness and access, and that few Americans consider eating abalone, cockles, squid, and octopus, for example, because it's not what they see on display.

Who Are the Seafood Eaters?

According to data from the National Health and Nutrition Examination Survey (NHANES) 2013–2016, only 1 in 5 adults aged 20 and older and 1 in 17 youth aged 2 to 19 consumes seafood at least twice weekly. This is a significant downward trend from the previous decade.

Men and women are equally likely to consume seafood. The percentage of adults who consumed the recommended amount of seafood increased with age, with only 17% of adults aged 20 to 39 meeting recommendations; however, 23% of those 60 and older consumed seafood at least twice per week. Non-Hispanic Asian adults were most likely to meet seafood consumption recommendations, with more than 40% reaching goals.[2]

Recommendations by Stage of Life

Children

In addition to protein and an array of micronutrients, omega-3 fatty acids in fish are critical to children's health. Specifically, DHA is essential for a child's developing brain, nervous system, and vision. Research suggests consuming fish early in life may help prevent asthma, eczema, and other allergic diseases.[3]

The FDA advises parents to offer fish to their children one to two times per week from a variety of low-mercury options. The following is a guide on appropriate portion sizes, which tend to vary, based on age and calorie needs.

- 2 to 3 years: 1 oz
- 4 to 7 years: 2 oz
- 8 to 10 years: 3 oz
- 11-plus years: 4 oz

A 2019 technical report from the American Academy of Pediatrics says that "compared to other animal protein, such as beef, pork or chicken, fish have a favorable nutrient profile and are a good source of lean protein, calcium, vitamin D, and omega-3 fatty acids."[3] However, children eat little fish relative to other protein sources. In fact, fish consumption among children has decreased every year since 2007 to levels not seen since the early 1980s.

Women of Child-Bearing Age

Because of the critical need for omega-3 fatty acids during fetal development and infancy, the American College of Obstetrics and Gynecologists advises women who are pregnant, may become pregnant, or are breast-feeding to eat 8 to 12 oz of low-mercury seafood weekly. The DHA status of the woman has profound and lasting effects on eye and brain development of her fetus and young child.

Yet, again, consumption rates are low. NHANES data from 2003 to 2010 find that 23% of women of child-bearing age and 14% of pregnant women reported eating no fish.[4] "Overly cautious, confusing, or just flat out inaccurate advice about how much and what kinds of seafood to eat during pregnancy actually results in decreased consumption of seafood," Kleiner says.

Dietitians help bolster seafood intakes when they provide positive, uncomplicated information about seafood and pregnancy and when they keep the messages short, such as, "Pregnant women should aim to eat a variety of seafood two to three times each week for optimal baby brain and eye development, as well as for the health of mom's brain and heart," Kleiner says. "The numbers show that most pregnant women in the US need to quadruple the amount of seafood they're eating. As dietitians, we can help expectant and new moms feel confident about eating more seafood."

Adults

The federal guidance for adults to eat 8 oz or more of a variety of seafood each week is based on the total nutrient profile and the amount of omega-3 fatty acids linked to reduced CVD risk. Consuming 8 oz of seafood each week is the approximate average consumption of 250 mg EPA and DHA daily, the amount shown to protect against primary and secondary cardiac deaths.[5]

The Dietary Guidelines for Americans Committee, which advised the development of the 2015–2020 Dietary Guidelines for Americans, also has found moderate evidence linking seafood consumption to lower risk of obesity. Though not highlighted in federal guidelines, seafood consumption—specifically seafood with high amounts of omega-3 fatty acids—may reduce cognitive decline in the elderly.[6] For example, a 2018 study in *American Journal of Epidemiology* found that older adults who ate fish four or more times per week had memory scores equivalent to being four years younger compared with older adults who rarely ate fish.[7]

A separate study found that as little as one serving of seafood with long-chain omega-3 fatty acids was linked to less cognitive decline in multiple domains of cognition.[7] A small survey conducted by Designsteins found that seafood-eating adults between the ages of 72 and 90 consumed primarily shrimp, tilapia, and flounder, none of which are especially high in omega-3 fatty acids. Among baby boomers, however, the survey found that shrimp and salmon are the most consumed species.

Though experts have advised Americans to consume seafood two or more times per week for years, many consumers are still unaware of this recommendation. According to the Food Marketing Institute, 59% of seafood consumers and 37% of nonconsumers reported knowing the recommendations for consumption.[8]

Bringing More Seafood to the Table

With seafood intake far below the recommended amounts, dietitians can encourage more frequent consumption of the most preferred species and that of various other species. Different types of seafood offer a wide range of nutrients. Various species provide zinc, iron, choline, iodine, selenium, vitamin D, vitamin B_{12}, and omega-3 fatty acids that together contribute to positive health outcomes, says Valerie Agyeman, RDN, communications manager for Seafood Nutrition Partnership. The greater the variety of seafood eaten, the more diversified and balanced the diet becomes.

In addition to better nutrition, Fitzgerald says individuals who expand their seafood repertoire become better cooks. Also, consuming seafood can be a more responsible way of eating because it allows consumers to focus on items that are more seasonal or abundant, meaning they're less likely to concentrate on less sustainable choices. While it's common to think of seafood as one type of food, it's a highly diverse category with variable environmental impacts and nutritional profiles, Fitzgerald adds.

Agyeman says sustainable seafood is wild-caught from a well-managed fishery or comes from a farm that follows responsible practices. While there are several seafood certification and oversight programs, asking seafood vendors

questions about how the seafood was harvested and where it came from is a great step, she says.

Since most people choose foods based on familiarity, Kleiner says RDs can teach clients about different species to help change their consumption patterns. Likewise, teaching clients how to prepare seafood and swap one species for another can boost intake.

The following are six ways to help consumers bust out of their seafood rut and expand their meal options.

1 Think beyond dinner. Put a seafood spin on breakfast, suggests John Livera, chef and consultant to the Norwegian Seafood Council. Top pizzas and fill tacos, burritos, and empanadas with any number of seafood types, he says. Combine seafood with eggs or go for a seafood-only version. Other breakfast ideas include a seafood frittata, crab and egg muffins, and a smoked salmon or lobster omelet.

Snack time is another opportunity to seek out the taste and health benefits of seafood. Sushi is a common go-to choice. Other ideas include tuna-filled deviled eggs; fish nachos made with a flaky white fish such as tilapia, pollock, or cod; crab quesadillas; and clam pizza made on a whole wheat English muffin.

2 Look for budget-conscious choices with wide availability. Consumers can find sustainable seafood options in both the canned and frozen aisles. Suggest canned sardines and frozen fish filets, which are readily available throughout the country and at a range of price points. Mussels or clams over pasta is another budget-friendly entrée.

3 Overcome pickiness. Help your clients experiment with flavors that they and their families already like. Create dishes with neutral fish such as cod, shrimp, haddock, or tilapia, Livera suggests. Try shrimp scampi, cod alfredo, mac and cheese with haddock, shrimp tacos, or simple buttered fish filets. When appropriate, serve them over rice or pasta with lots of sauce to encourage trying new foods with familiar flavors. Kleiner recommends clients add seafood to common recipes, such as adding canned anchovies, clams, or sardines to spaghetti sauce. When eating out, she encourages people to select a new fish or shellfish meal for the whole table to taste and share.

4 Relieve seafood intimidation. For clients who feel nervous about cooking seafood, Livera offers these simple seafood combinations.

- Cod or grey sole topped with melted butter or olive oil, bread crumbs, and a squeeze of lemon juice served over rice and steamed vegetables.
- Steelhead trout brushed with jarred BBQ sauce and baked in the oven. Serve with crispy onions and a baked potato.
- Striped bass wrapped in aluminum foil with orange juice, butter or olive oil, and fresh or dried thyme. Bake it or grill it.
- Cod and bacon cooked in the oven on the same tray and served over roasted potatoes and steamed vegetables.

Livera also encourages experienced home cooks to swap other animal proteins for seafood in some of their common recipes to get more comfortable with various species. Some of his examples include the following:

- Pulled pork: hot smoked salmon or steelhead trout (Shred the meat and add the same style sauce as you would for pulled pork.)
- Kung Pao: shrimp, scallops, cod, tilapia (Lightly batter the fish and bake or fry before adding Kung Pao sauce.)
- Française: shrimp, scallops, haddock, fluke (After dredging the seafood in seasoned flour, dip it in egg and cook it in hot oil with white wine and lemon juice.)
- Tandoori: cod, sturgeon, monkfish (Trade the typical chicken in a tandoori chicken masala for seafood and prepare in a traditional tandoori style.)

5 Encourage simple seafood swaps. It shouldn't be hard for clients to trade one type of seafood for another when they let color and texture guide them, Livera says. Instead of giving up on preparing a seafood recipe when the specified fish isn't available, find a suitable substitute. Livera groups together the following types of seafood that can serve as substitutes for one another:

- salmon, steelhead trout, Arctic char, Coho salmon, and sockeye salmon; and
- cod, grey sole, flounder, striped bass, haddock, and fluke.

Clients who enjoy canned salmon or tuna also may like exploring cooking with swordfish, monkfish, sturgeon, and Norwegian wolfish or ordering them in restaurants.

6 Clear up confusion about mercury. Reassure clients that advice from the FDA and EPA to choose low-mercury seafood options is meant for women who are pregnant, may become pregnant, or are breast-feeding, and for children. The guidance to avoid certain species isn't directed at populations at lower risk of harm from methylmercury ingestion. In addition, the guidance is based on a cautious approach, so at-risk populations can benefit from seafood while limiting exposure to methylmercury.[9]

Common choices that are higher in EPA and DHA but lower in methylmercury include salmon, anchovies, herring, shad, sardines, oysters, trout, Atlantic mackerel, and Pacific mackerel (not king mackerel).

Finally, dietitians can educate clients on the benefit of selenium in seafood. Not only is selenium an important mineral for brain and immune health but it also helps counter the potential adverse effects of methylmercury. Methylmercury can be harmful if consumed in excess. It binds with selenium, preventing selenium from performing its role in the brain. Eating fish with a high selenium to methylmercury ratio, however, provides a built-in defense against methylmercury and can offset or even ameliorate potential damage. Fortunately, most types of seafood from the ocean—except large species such as pilot whale—contain significantly higher amounts of selenium than methylmercury.

By sharing the health benefits of eating seafood, emphasizing the importance of variety for nutrition and the environment, and teaching clients about various species and preparation methods, dietitians can help clients consume and enjoy more seafood. ■

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Weisenberger reports the following relevant disclosure: She's a nutrition and diabetes consultant to the food industry, including the Norwegian Seafood Council.

For references and a chart, view this article on our website at www.TodaysDietitian.com.

Dietetics experts discuss the key components of starting and maintaining a virtual nutrition business.

By **KRISTI COUGHLIN, MS, RD**

Telehealth in

Private Practice

In the midst of the COVID-19 pandemic, more health care practitioners than ever before have turned to telehealth to continue providing medical care to patients—and dietitians are no exception.

Telehealth, a technological platform used to provide clinical services, has been a growing trend within the health care profession for many years.[1] Also known as telemedicine, telehealth is a catch-all term that includes elements of virtual health care services and health information technology, as well as the administrative functions of electronic health records (EHRs), such as charting, client intake forms, file sharing, and video chatting.[2]

In a private practice setting, dietitians use telehealth to conduct online nutrition counseling services, communicate with clients in between sessions, and maintain EHRs. By implementing telehealth, dietitians have the ability to reach clients outside of their geographic area, improve accessibility to and communication with clients, and streamline administrative functions such as charting and document sharing.

According to the Academy of Nutrition and Dietetics (the Academy), 30% of dietitians reported using telehealth services with clients in 2015. More dietitians have become interested in telehealth, but many are hesitant to implement it in their practices due to the inconsistency of licensure from one state to the next, lack of knowledge of how to implement telehealth into a private practice setting, and a gap in understanding of insurance coverage of telehealth services. In fact, 70% of dietitians aren't versed in legal matters surrounding telehealth services across state lines.[3]

While there are legal issues to learn and understand, it's imperative dietitians become familiar with their state's regulations. For logistical matters, the use of a telehealth platform can ease the transition into working online. Despite the lack of knowledge preventing dietitians from embracing telehealth, the COVID-19 pandemic has prompted many to try it and stick with it.

When implementing telehealth in a private practice setting, there are four steps to take: 1) learn about legal matters such as licensure, HIPAA, and liability insurance; 2) determine the services you want to provide; 3) select a telehealth platform best suited for your practice; and 4) develop a marketing strategy.

To help dietitians learn more about telehealth, *Today's Dietitian* (*TD*) sits down with six dietetics professionals to ask them what's involved with implementing the platform, what are the benefits, and what are the legal issues to consider.

Alissa Rumsey, MS, RD, CSCS, is founder of Alissa Rumsey Nutrition and Wellness, a virtual weight-inclusive private practice specializing in intuitive eating, disordered eating, and body image healing in New York City.

Melissa Groves Azzaro, RDN, LD, is owner of Avocado Grove Nutrition, an integrative nutrition practice for women in Portsmouth, New Hampshire.

Amber Gourley, MS, RDN, LD, CDCES, PCC, is owner and founder of Heal U, LLC, a private practice group specializing in women's health and wellness in Northeast Tennessee.

Angela Lemond, RD, is owner of Lemond Nutrition, a medical and wellness nutrition private practice based in Plano, Texas.

KC Wright, MS, RDN, is a research dietitian at Dartmouth-Hitchcock Health in Lebanon, New Hampshire.

Whitney Bateson, MPH, RD, is owner of Whitney Bateson Digital Strategy, a digital marketing agency based in Washington, D.C.

TD: What criteria should dietitians use to decide when it's appropriate to offer telehealth in a private practice?

Wright first considers whether her clients can operate a computer and are familiar with the internet. If they're not tech-savvy, she determines whether they have the ability to learn about technology along the way. Before providing telehealth services, Rumsey decides whether it's best to work with a client online or in person based on the client's medical issues. For example, she says telehealth appointments may not be appropriate for clients with eating disorders because it's easier for them to hide body language during virtual counseling sessions, presenting a challenge for dietitians attempting to interpret what they're trying to communicate or not communicate. Rumsey adds that an online relationship also may make it difficult for dietitians working with clients with comorbidities to address all of their underlying health issues.

Gourley says it's appropriate to offer telehealth services if a dietitian can't start a business in a physical location due to financial constraints. "Dietitians should take into account their financial limitations and their own preferences and desires for running a private practice. If you're limited financially, creating a home office and offering telehealth services can provide a low-cost start," she says.

Gourley adds that dietitians should think about the type of work they like to do and be aware that working with clients strictly online can be draining because clients tend to withhold information, forcing dietitians to read their body language and draw out answers.

TD: How do dietitians and clients alike benefit from the use of telehealth?

According to the RDs interviewed, the most significant benefit of telehealth is the ability to counsel clients no matter where they're located. Groves Azzaro says telehealth particularly is helpful for her and other dietitians who provide highly specialized services, adding that since she lives in a small town in New Hampshire and counsels clients with PCOS and infertility, she needs to extend her geographical reach to boost her client base. Similarly, when clients are seeking a specialist, they have more options.

Rumsey says the convenience of offering telehealth services has resulted in few no-shows—online counseling eliminates drive time for clients to and from sessions. She says the few cancellations also may be attributed to "clients being able to participate in sessions on their lunch break or at their office before commuting home. In addition, clients who travel regularly can attend sessions when out of town for business."

What's more, offering telehealth services allows for flexible work hours and low overhead costs, and enables dietitians to write chart notes while speaking with patients, which is difficult to do during in-person sessions, Groves Azzaro says.

TD: What should dietitians be concerned about when implementing telehealth in a private practice?

Because technology can malfunction at any moment and cause an RD to lose the connection with a client, Wright says dietitians should be mindful of internet reliability. To avoid this problem, Wright suggests RDs have a backup plan such as immediately switching to a traditional phone call when internet signals are weak or lost. And dietitians should make sure their devices are adequately charged before online sessions.

According to Lemond, it's important for RDs to adhere to confidentiality protocols. "Telehealth sessions must be done confidentially without any family members or people around," she says. This applies to the physical area the dietitian and client are occupying during counseling sessions. The dietitian and client must be in a secure location where no one else can hear their conversations.

"This prevents clients from being distracted and enables them to engage with you during the session," Lemond says.

Rumsey says it's important for RDs to develop no-show policies and keep their clients' credit cards on file to uphold cancellation fees. Another aspect of telehealth dietitians should be concerned about is ensuring services are covered by liability insurance. Groves Azzaro says professional liability insurance protects business owners and companies from malpractice claims, such as negligence, omissions, and errors. She says having liability insurance is important to protect personal and business assets from lawsuits.

TD: What legal issues do you need to consider when starting a private practice and using telehealth as a tool?

According to Groves Azzaro, dietitians need to stay abreast of ever-changing state licensure and federal laws that can differ from state to state. Licensure is based on the client's state of residence.

Groves Azzaro says RDs should learn about the laws in every state in which they operate since each state is responsible for implementing and enforcing its own laws pertaining to licensure. As a reference, the Academy has published a state-by-state list of licensure laws.[4]

Gourley agrees, adding that federal guidelines often are outdated. "At times, they don't mention telehealth specifically, leaving providers to interpret the laws for themselves," she says.

Gourley is hopeful that federal guidelines will be updated since the use of telehealth services has increased because of the COVID-19 pandemic. She adds that RDs may require clients to sign an informed consent document or verbally agree to its terms regarding the benefits and risks associated with telehealth services.

Rumsey says that while many states have licensure laws, states such as New York don't. And there are different levels of licensure. For example, the title "registered dietitian" is protected in California, but the state doesn't have any other regulations. Conversely, some states have stringent licensure laws outlining and limiting scope of practice for dietitians and other health care professionals.

Wright says dietitians also must abide by HIPAA regulations to comply with

Department of Health and Human Services requirements, which is outlined in greater detail in the following section.

TD: How do you remain HIPAA compliant when operating an online private practice?

Gourley says RDs must communicate with clients using HIPAA-compliant tools. By using a telehealth platform, such as Healthie, Practice Better, or Kalix, dietitians can ensure the tasks completed on the platform are secure. Gourley says it's essential to keep client information on the platform, meaning don't send e-mails or text messages or use other forms of external communication. Lemond adds, "Computers and systems must follow the strictest of protection for clients and patients."

In cases of private practices with multiple providers, HIPAA training is critical.

Rumsey says it's vital for dietitians in private practice who accept insurance to be HIPAA compliant, a requirement of the Department of Health and Human Services. However, providers who don't accept insurance may not fall under the regulations of HIPAA.[5] Rumsey suggests RDs do their research, adding that HIPAA compliance is considered a best practice.

In accordance with HIPAA guidelines, a business associate agreement (BAA) needs to be on file with the company providing the technology service. A BAA between the technology company and a business, in this case the private practice, notifies the technology company that it will have access to protected health information. By having a BAA on file, it satisfies HIPAA regulations by ensuring sensitive information shared through the technology company will be protected. Examples of when a BAA is needed include the use of a telehealth platform, when using G-Suite or other e-mail providers, or in the case of an internet phone number.

Groves Azzaro agrees that it's important to ensure confidentiality of sensitive health information. Clients need to be aware their personal information won't be shared via unsecure forms of communication, such as e-mail, text, and social media. She reminds her social media followers not to share personal health information in post comments or via direct message.

TD: What services do insurance companies consider reimbursable when using telehealth in practice?

Gourley says insurance reimbursement varies from one insurance company to another. "Providers are encouraged to contact insurance companies directly, as coverage can differ considerably between states, even within the same company," she says. In some cases, telehealth services are covered only after an initial in-person consultation, while other insurance companies cover all telehealth sessions without that stipulation.

Medicare historically has limited the use of telehealth services to clients residing in rural areas and stipulated that providers may participate in sessions only while located in an approved setting, such as a medical facility or a doctor's office. Therefore, due to the variations in policies, it's difficult to answer specific questions about insurance coverage and reimbursement. Nevertheless, it's anticipated that telehealth services will be more widely covered by insurance companies moving forward due to the COVID-19 pandemic.

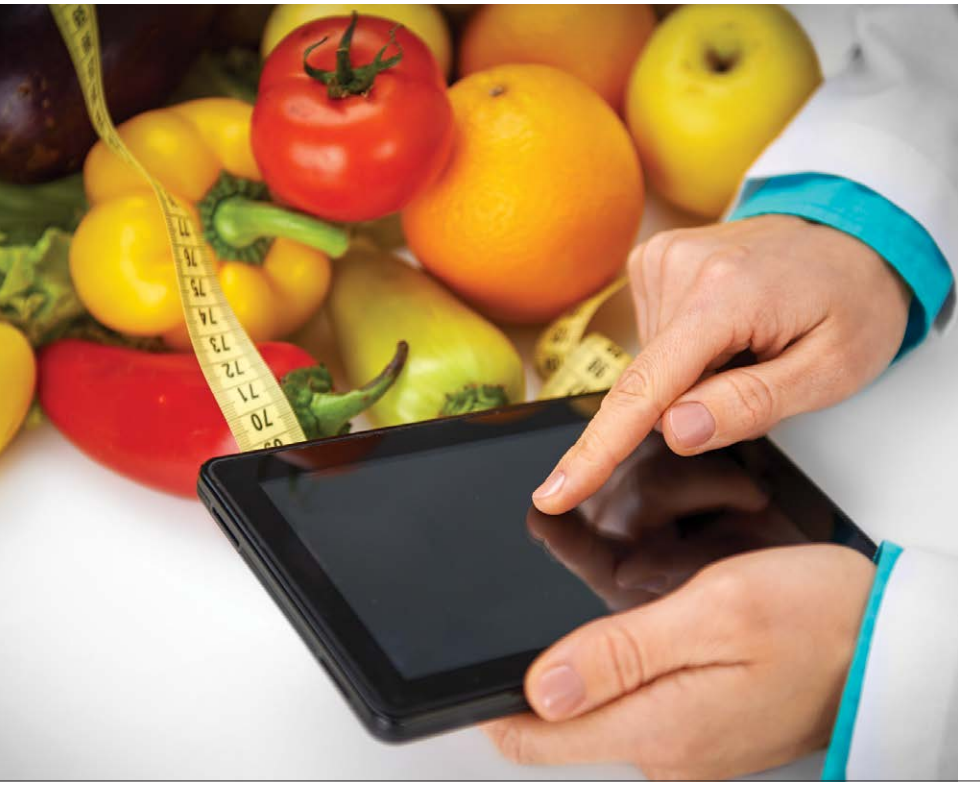
The process for submitting claims for insurance reimbursement is fairly straightforward, Gourley says. "Practices that contract with insurance companies may submit and process paperwork for reimbursement through the telehealth platform," she says. "In some instances, providers submit insurance claims in the same manner they do for traditional private practices, using an insurance clearinghouse."

Reimbursement isn't a concern for cash-pay private practices, but credit card payment processing still is necessary, Rumsey says. Many telehealth platforms include payment processing via credit cards, so RDs may not have to seek out such a service.

TD: What type of services can telehealth provide?

One-on-one sessions with patients are the most common services dietitians offer, Rumsey says. However, "most dietitian services offered in person also can be offered online," such as group sessions, self-paced online courses, meal support for eating disorders, cooking demonstrations, and telemonitoring.

According to Gourley, telemonitoring involves reviewing data collected by Bluetooth-enabled devices, including the Apple Watch, blood pressure cuffs, glucometers, and activity trackers such as FitBit, to monitor clients' health and provide intervention as needed between sessions. For example, telemonitoring enables dietitians working with clients



with diabetes to remotely view their blood sugar levels and identify trends. The information gathered can be used during or in between sessions to adjust eating patterns to help stabilize blood sugar.

Groves Azzaro adds that when dietitians structure their nutrition counseling services, they should consider doing so in packages. This enables RDs to have more predictable income as clients are contracted for a set number of sessions included in the package.

TD: What should dietitians look for when deciding on the best telehealth platform to use in private practice?

Rumsey suggests RDs first consider which platform features their practice needs. For example, does their practice need only video chat capabilities and an EHR, or will they use paper charting? She says the more common telehealth platforms have similar features, such as video chat, messaging capabilities, and charting.

From there, Rumsey says dietitians should consider the nice-to-have features, including group services and self-paced online courses. She also says there's value in using free trials from different platforms to determine which one "best suits the way your brain works."

In addition, dietitians should ensure the platform is user-friendly for clients and take into account whether or not the telehealth company offers tech support, Wright says. Otherwise, RDs will need time to troubleshoot computer issues with clients.

Gourley suggests RDs consider their budget and the price of the platform. Pricing for telehealth platforms can range from $27 to more than $149 per month, depending on the desired features selected and the number of clients or providers within the practice using the software.

TD: What is the best way to market telehealth services?

For RDs operating an insurance-based practice, Gourley suggests contacting referral coordinators at doctor's offices to get referrals from the doctor. Referrals also can come directly from the insurance company through clients searching the insurance company's internal directory.

Groves Azzaro says word-of-mouth referrals from friends and family are a good place to start when launching a new private practice. She first began receiving referrals from other dietitians and providers working in similar specialties but now credits social media as her primary source of new clients.

Bateson suggests dietitians use their websites as business cards to promote their private practices. She says dietitians must know their niche to ensure they target the right patients. This will enable them to develop clear messaging on their websites that will resonate with potential clients and prompt them to book a discovery call. Bateson also suggests RDs upload a short video about their practice and the services they offer on their website's homepage. Their personalities will emanate and possibly start a working relationship with potential clients.

Rumsey agrees, adding she gets the majority of her clients through her website from Google searches, taking full advantage of search engine optimization. Other means of generating new clients can come from aggregate websites, such as the Academy of Nutrition and Dietetics' Find an Expert, Health Profs, and Nutritionist Near Me.

Gourley recommends "picking a couple of different marketing techniques, such as short-term (doctor's referrals) and long-term (social media) strategies." This ensures the practice has multiple streams for acquiring new clients, which is important for long-term success.

TD: If you could give dietitians one piece of advice for starting or transitioning to an online private practice, what would it be?

Wright suggests focusing on motivational interviewing skills to make sessions more effective, adding that there's value when focusing on SMART (specific, measureable, attainable, realistic, and time-bound) goals, especially when working with long-term clients. By providing SMART goals, clients are set up for greater success.

Groves Azzaro simply says, "Do it!"

And Gourley agrees, saying, "Don't be afraid to pivot. I started my practice 100% online and decided to start seeing clients in person as well."

TD: How has COVID-19 impacted your practice and how you provide nutrition counseling services?

In the face of the COVID-19 pandemic, Medicare made the unprecedented decision to expand reimbursement for health care services provided by phone or video chat, Gourley says. Medicare is no longer limiting these services to rural regions or certain locations. While this means Gourley potentially can see more clients, she has noticed a decrease in client referrals from other medical providers. However, when Gourley stopped in-person counseling, all but three of her clients agreed to continue with telehealth.

Groves Azzaro and Rumsey always have provided telehealth-only services, so their workloads haven't changed much since the pandemic began. While they continue business as usual, Rumsey says now is the time to evaluate creative payment options, such as adjusting the frequency of payments to help make services more affordable. She also suggests dietitians consider offering tiered services with varying levels of care or group sessions with different price points to give clients choice.

Due to COVID-19, Lemond's practice has shifted from an entirely in-person nutrition business to a 100% virtual practice. While she was initially apprehensive to move to a virtual practice, she believes incorporating telehealth into her business will be a lucrative shift.

Gourley asks her clients questions about food safety and offers ways to optimize nutrition status to support their overall health to help them limit the transmission of the virus.

Because of their business models, Groves Azzaro's and Rumsey's private practices initially weren't impacted by COVID-19. They both contracted with clients for three months of services and often with fees paid upfront.

Without a doubt, the COVID-19 pandemic has ramped up the use of telehealth, and its increased use is expected to remain long after the pandemic resolves and life returns to some sense of normalcy.[6] Lemond says, "Telehealth services [are] a way dietitians can stand out as nutrition experts and really start having an impact on our health system." ■

Kristi Coughlin, MS, RD, is a former telehealth private practitioner turned creator of an inspirational products business based in Bend, Oregon.

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IMPROVING SCHOOL WELLNESS

By **Christen Cupples Cooper, EdD, RDN**

The Healthy, Hunger-Free Kids Act (HHFKA) of 2010 required schools participating in the National School Breakfast and Lunch Programs to increase offerings of whole grains, fruits, and vegetables, limit milk to lower-fat varieties, and serve meals within specific calorie ranges. HHFKA brought school meals in line with the Dietary Guidelines for Americans for the first time in more than 30 years. Offering more healthful choices is a large step toward helping children to eat healthfully at school.

A study by Terry-McElrath and colleagues published in *JAMA Pediatrics* in January 2015 analyzed data from a national cohort and found that offering fruits and vegetables and only fat-free or low-fat milk, and actively working to improve school nutrition environments were associated with lower risk of overweight and obesity among high school students. In addition, findings from a study by Anderson and colleagues published in the *Journal of Public Economics* in December 2018 suggest that the more healthful the food at schools serving lower-income students, the higher the students' test scores. Students eating high-quality school food scored 40% higher than students eating lower-quality school food.

Dudley and colleagues published a systematic review and meta-analysis on effective interventions to increase children's healthful food intake at primary schools in *The International Journal of Behavioral Nutrition and Physical Activity* in February 2015. Their findings suggested that the most effective strategies to increase intake of healthful foods such as fruits and vegetables involved experiential learning approaches such as gardening, enhanced curricula, and cross-curricular integration of nutrition education. Other strategies, such as parental involvement, also showed promise.

Graziose and Ang performed a review, published in *Preventing Chronic Disease* in May 2018, of 49 studies on factors influencing elementary children's school day fruit and vegetable intake. They found that several factors had consistent, positive associations with fruit and vegetable consumption at lunch across two or more studies: sliced instead of whole fruits, serving vegetables before other foods, allowing more time for eating, using incentives and social marketing and/or nutrition education curricula, and serving meals that adhered to the HHFKA standards.

According to the Centers for Disease Control and Prevention's (CDC) 2019 report "Comprehensive Framework for Addressing the School Nutrition Environment and Services," "Schools play an important role in helping students establish healthy eating behaviors by providing nutritious and appealing foods and beverages, consistent and accurate

From the cafeteria to the schoolyard, innovative programs are helping kids to eat more healthfully and become more physically active.

messages about good nutrition, and ways to learn about and practice healthy eating. Nutrition education is a vital part of a comprehensive health education program and empowers children with knowledge and skills to make healthy food and beverage choices."[1]

The report promotes implementing nutrition education using a wide range of learning activities that go beyond the cafeteria experience to include school gardening, classroom learning, farm-to-school programs, and events involving parents and the community. It brings together research on several strategies that have promoted healthful food options: encouraging children to taste food they've grown, including verbal prompts from school nutrition staff, taste tests, nutrition signage, and displaying student artwork that depicts healthful foods.

Still, despite several federal-level school-based programs moving into many schools in the past decade—including the USDA Fresh Fruit and Vegetable Program, Chefs Move to Schools Program, Salad Bars to Schools Program, and the Farms to Schools Grant Program—the Produce for Better Health Foundation State of the Plate Reports from 2010 to 2015 found that there hasn't been a significant increase in school fruit and vegetable consumption over the years. Thus, the time is ripe for innovation and alternative approaches for increasing healthful food intake in the nation's schools.

FoodCorps

The nonprofit organization FoodCorps boasts innovative solutions that connect children to healthful foods in schools across the country. Curt Ellis, cocreator of the documentary *King Corn*, founded FoodCorps in 2010 to help children "discover what they love to eat rather than telling them what they should eat," as he states in a *New York Times* article published January 3, 2020.

Ellis stresses the importance of working in the school environment to promote healthful, whole foods because "it's incredibly important to give kids the tools and the skills they need to build their own relationship with healthful food, and our job is to support them in that."

To understand how kids perceive school food and school food environments, FoodCorps interviewed 400 students, teachers, school food workers, and other staff representing nine diverse schools. Some children complained about the lack of flavor in foods. Others wished to see more meals that reflected their cultural preferences. Still other students noted that school cafeterias often are windowless and cramped and that they have too little time to consume their meals.

FoodCorps developed a program to change the whole school meal experience. As described in the *New York Times* article, FoodCorps responded with its "Reimagining School Cafeterias" project, which added plants and natural lighting to eating spaces. In addition, its "Tasty Challenge" invited kids to try vegetables prepared in different ways. The kids voted on their favorites, which afforded them a sense of power over their food choices. FoodCorps also introduced "flavor bars" where students can add seasonings such as hot sauce, adobo, and garlic to their dishes. FoodCorps also worked to provide tasty, sustainable greens with its $1 million, two-year partnership with Sweetgreen, a fast-casual dining franchise launched in 2007. The partnership, "Sweetgreen in Schools," began in 2010 and has reached 9,000 students, bringing curriculum-based nutrition and sustainability education to fourth- and fifth-graders.

The nonprofit organization FoodCorps boasts innovative solutions that connect children to healthful foods in schools across the country.

Another FoodCorps project is "Our School Cafeteria," which, in 2019–2020, involved 15 pilot schools across the country, calling on kids to brainstorm ways to update their school cafeteria layouts to make them more pleasant and easier to navigate. FoodCorps hopes to take the program to 50 schools in 2020–2021.

The Tisch Center for Food and Education Policy at Teachers College, Columbia University in New York City, performed an evaluation of FoodCorps in 20 schools across the country. It found that more than 75% of schools participating in FoodCorps had measurably more healthful school food environments after one year of participation.[2] Students at schools that engaged in the most hands-on learning experiences ate three times more fruits and vegetables than students who had fewer of these experiences. In addition, the more time FoodCorps service members spent in schools and the more FoodCorps resources that were present at a school, the more healthful the school environment.

The Tisch Center used a tool to measure the health of the school environment that took many factors into account, including foods served, the ambiance of the cafeteria, signage, and other aspects.

"Schools have so much they need to accomplish, and while food and nutrition education and good school meal experiences are something almost everyone in schools thinks are good ideas, it can be hard to have the time, experience, and attention to devote to food," says Pam Koch, EdD, RDN, executive director at the Tisch Center for Food and Education Policy, and an associate professor of research at Teachers College, Columbia University. "I think this will become even more challenging with the real struggles schools face in the COVID-19 environment and will continue to face as we recover from the impact of the pandemic."

State of School Physical Activity

According to the Department of Health and Human Services' "National Physical Activity Plan" (NPAP), published in 2016 by the NPAP Alliance, only 21% of US children aged 6 to 11 meet physical activity guidelines. The plan also states that only 1 in 3 children engages in physical activity daily and yet children should engage in vigorous activity and "muscle- and bone-strengthening activities" at least three days per week.

Regular physical activity not only helps children grow and develop physically but also confers many other benefits. There's evidence that regular physical activity has immediate and long-term impacts on academic performance,[3] including improved grades, higher scores on academic achievement tests, and increased time on tasks.[4]

Physical activity also has been shown to increase classroom attentiveness and offers psychological benefits to children, such as increased self-confidence, self-esteem, and stress management.[5,6] Finally, physical activity provides social

benefits, as children regularly interact when they're active together.[7]

On the flip side, not being active as a young person can lead to health harms. Physical inactivity has contributed to our nation's rise in obesity among children and adolescents, which rose from 7% to 18% between 1980 and 2014.[8]

Because children spend a large portion of their days at school, this venue provides unique opportunities for encouraging physical activity in several ways, such as informally at recess, in physical education classes, in the classroom, and during after-school programs. The CDC report concludes that recess is a crucial part of students' school experience. The *Shape of the Nation* report, published by the Society of Health and Physical Educators in 2016, shows that only eight states have policies requiring daily recess in schools, and many schools enable students to replace recess with substitute content.

Recess, the CDC reports, contributes to normal growth and development; increases social skills, such as cooperation, following rules, problem solving, and communication; and improves engagement in classroom activities, such as being on task. It also enhances cognitive performance, especially attention and memory.[5]

In an article published in the *International Journal of Behavioral Nutrition and Physical Activity* in February 2004, Baranowski asserts that nutrition and physical activity are complementary when it comes to improving the overall school wellness environment. He states that "the behavioral science components of these two disciplines face similar problems and can learn from the advances made by the other in the areas of measurement, correlates, and intervention. By working together, knowledge will be enhanced from uncovering complementary and interactive relationships between diet and physical activity, and in relation to disease risks, that may result in designing more effective and efficient interventions and policies."

Wellness in the Schools

One organization that has adopted a broader, inclusive view of wellness, combining nutrition with physical activity, is Wellness in the Schools (WITS), a national nonprofit that inspires healthful eating, environmental awareness, and fitness as a way of life for kids in public schools.

WITS started in 2005 with the vision of Nancy Easton, a New York City public school teacher who was concerned about unappealing, unhealthful school food and a lack of school-based nutrition education. Renowned chefs such as Bill Telepan, executive chef at the elite Oceana restaurant on New York's Upper West Side, joined the effort in its first year and other chefs followed.

Today, WITS reaches more than 95,000 students in over 190 public schools. In 13 years of operation, WITS has provided more than 11 million school meals and led more than 54,000 hours of guided play. Funded by public-private partnerships, WITS works with schools to provide healthful, scratch-cooked meals, active recess periods, and fitness and nutrition education. The organization aims to drive systemic, long-term change, transforming the entire wellness culture of schools with its programs, which include the following:

- **Cook for Kids** ensures that whole, real foods, rather than processed and packaged foods, are served at mealtimes. The program uses WITS chefs who are trained culinary graduates and work to improve cafeteria menus, provide training on the changes, educate school staff, and offer nutrition education to students.
- **Coach for Kids** brings WITS coaches, who are trained fitness professionals, to schools to reinvent recess, train school staff, and provide fitness education to students. The coaches lead group activities during recess on the playground or, during inclement weather, in indoor spaces.
- **Green for Kids** brings gardening into the classroom and cafeteria, combining hands-on edible gardening and interactive, accessible environmental education for schools.

The Tisch Center has studied WITS. A study by Priya Khorana, EdD, and a research team that included Koch, involved a quasi-experimental matched-controlled design with seven WITS intervention schools and seven matched-controlled schools to measure two outcomes: students' physical activity level and physical activity type. Outcomes were measured in second- and third-graders before the introduction of the WITS program and then one school year after program introduction. They studied both outdoor and indoor recess.

Their findings, published in December 2019 in *Physical Activity and Health*, found that the WITS intervention increased physical activity during indoor recess. They also found that a higher percentage of WITS girls and boys were vigorously active, a lower percentage were sedentary, and overall recess physical activity levels at WITS schools were higher. In addition, they found that ball-like activity participation by both boys and girls during outdoor recess was higher at WITS schools.

"My experience working with WITS was awe-inspiring," Khorana says. "We were immersed in schools for a year and learning about the students was humbling and exciting. WITS is an organization that pulled on my heart strings, as they not only teach the students the importance of healthful living but also involve the entire community surrounding the school. Parents, teachers, and staff all get to be involved in collectively offering the students the best chance at life by instilling healthful eating and behavioral practices at such a young age."

Koch, who headed the Tisch Center's evaluations of FoodCorps and WITS, says such programs bring unique opportunities to RDs to do important, creative work in schools. "All RDNs can work alongside teachers, principals, and school foodservice staff at their local schools to provide students with great hands-on experiences with food through gardening, cooking, food justice work, food system analysis, media literacy, and positive school meal experiences," Koch says.

She also emphasizes how such programs afford dietitians opportunities not only to participate in changing school food and physical activity but also engage in research and evaluation. "What I really loved," Koch continues, "was that I could bring all of my research design, data collection, and analysis skills to organizations that are on the ground doing this important programming." ■

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Cannabis & CBD Edibles

BY **JANICE NEWELL BISSEX, MS, RDN, FAND**

The legalization of medical cannabis in California in 1996 paved the way for more and more states to legalize cannabis for both medical and recreational adult use and cracked open the door for much-needed medical research. A survey found that 66% of Americans support the legalization of cannabis. Its medical use is now legal in 33 states, while adult recreational use is permitted in 14 states.[1,2] The 2018 Farm Bill removed hemp from Schedule I status and legalized its growth and production, making the compound cannabidiol (CBD) widely available nationwide.[1]

Research has shown that cannabis and CBD may be helpful in managing a variety of conditions, including pain, depression, anxiety, inflammatory bowel disease, seizure disorders, insomnia, inflammation, and posttraumatic stress disorder.[3,4] There are many different modes of administration, but not all delivery methods work equally well for all people and conditions.

The most common ways to use CBD and cannabis are oil tinctures placed under the tongue, softgels and edibles, topical creams applied to the skin, and inhalation via vape pen, pipe, or smoking a joint. Other delivery methods include transdermal patches applied to the wrist or ankles, water-soluble tinctures added to a beverage, and rectal and vaginal suppositories. Each form of delivery has varying times of onset, duration, and optimal therapeutic uses. This article will focus on cannabis and CBD edibles.

Rise in Popularity

Edibles, sometimes referred to as ingestibles, have become an increasingly popular method of cannabis and CBD consumption. People who are interested in exploring the therapeutic benefits of cannabis may be averse to smoking but willing to try gummies, brownies, or a pill instead. The largest growing market for cannabis products consists of baby boomers and older adults, so it isn't surprising that edibles, such as gummies and softgels, have gained popularity. Edibles are

This common mode of administration will give clients another option to help manage a variety of health conditions.

discreet and inconspicuous, with no associated smell or smoke, and don't require any additional equipment.

The sales numbers are telling, with the percentage of cannabis sales from edibles growing from 2.5% in 2016 to 13.7% in 2018.[5] There was an estimated $1 billion in edibles sales in 2017.[6] With 12% of adults reporting using cannabis on a daily basis, these numbers are expected to climb. Edibles may be a particularly good choice for cancer patients, athletes, patients in palliative care, individuals with lung disease or asthma, elderly patients, those with gastrointestinal issues such as Crohn's disease and ulcerative colitis, and individuals with chronic pain.

CBD and THC Edibles

Edibles are available with CBD, tetrahydrocannabinol (THC), or both. Which product or cannabinoid ratio to choose depends on the desired effect. There's dramatic synergy among the cannabinoids, terpenes, and flavonoids in cannabis and hemp. Each individual component of the plant may provide therapeutic benefits on its own, but when combined together the so-called entourage or ensemble effect is dramatic. For this reason, it's best to choose broad- or full-spectrum whole plant products vs isolates.

CBD is a compound (cannabinoid) found in cannabis and hemp plants. In recent years, CBD has gained popularity for its purported health benefits and therapeutic effects. Many people find that CBD helps manage pain, inflammation, anxiety, muscle spasms, insomnia, inflammatory bowel disease, irritable bowel syndrome, migraines, neurodegenerative disorders, and much more.

THC is another cannabinoid found in cannabis and hemp plants. It's best known for its intoxicating effects—too much will get you "high" or "stoned"—but it has anti-inflammatory, antispasm, antinausea, analgesic, and bronchodilator effects. It also can help stimulate appetite and relax muscles.

Gummies have cornered the edibles market. In 2019, gummies accounted for 43% of sales within the cannabis edibles market, compared with chocolates at 12% and mints at 3%.[7] Other types of edibles on the market today are raw honey, lollipops or hard candy, beverages, and baked goods, such as cookies, muffins, and brownies. Cookbooks are becoming increasingly popular as consumers start to experiment with different ways to cook and bake with cannabis.

Advantages and Disadvantages of Ingesting Cannabis

Cannabinoids (CBD and THC) that are consumed have a 6% to 10% bioavailability rate.[8] Individual physiological factors, such as absorption, metabolism, and excretion rates, and rates of metabolism and excretion can affect the bioavailability of cannabinoids from person to person. Consuming an ingestible after a meal or with a food containing fat, such as nuts or avocado, will increase absorption and availability.

It's important to note that edibles have a significantly delayed onset time vs smoking, ranging from 30 minutes to a few hours compared with just minutes after inhalation.[9] This is because edibles must travel through the digestive tract and undergo first pass metabolism by the liver before reaching the bloodstream. The effects from an edible can last six to 12 hours (sometimes as long as 24 hours) compared with one to three hours with smoking. So edibles can be an advantage for people with chronic pain, as the therapeutic effect lasts longer with the slower onset time.

THC edibles may have a more intoxicating effect when compared with other methods of consumption. There are two reasons for this. First, liver metabolism results in some of the delta-9 THC being converted to the more potent 11-hydroxy THC. This form of THC crosses the blood-brain barrier more easily and results in an increase in intoxication.

Second, given the delayed onset time, individuals may get impatient when they don't feel any effect and might be tempted to take an additional dose (or bite). Health professionals should caution against this, noting that if someone overingests, the high may become too strong later on to the point of being uncomfortable. It's always best to wait two hours before taking another bite/dose of a THC-containing edible to first determine the impact of the initial dose.

Dosing and Safety Considerations

Dosing of edibles depends on the individual. Some people may find relief with just 1 to 2 mg of THC or CBD, while others may require 25 mg or more. Be mindful that THC edibles typically are sold in 10-mg doses at dispensaries. This is a high amount of THC for many people and wouldn't be recommended for someone new to cannabis or for older adults.

Edibles affect everyone differently, based on several factors: the type and potency of the edible, individual tolerance and body chemistry, and what and how much was eaten before consuming.[10] Up to 1 in 5 people may not respond at all to cannabis or CBD edibles due to genetic factors. In contrast, alcohol users may hyper-respond when ingesting edibles. First-time users should know the potency of the edible and experiment with a maximum starting dose of 2 to 5 mg THC (labeled when purchased from dispensaries). It's generally recommended to start low and go slow to find the dose that works best.

Cannabis and Drug Interactions

Other safety considerations are drug interactions. The cytochrome P450 enzyme system in the liver metabolizes about one-half of all prescription medications. This enzyme also breaks down cannabis and CBD, so it's possible that the blood levels of certain medications may be impacted by ingestibles.[11] If a patient is taking a drug such as warfarin (Coumadin) or certain antiarrhythmics with a narrow therapeutic window, it's best to proceed with caution when using edibles. A general guideline to follow: If grapefruit is contraindicated with a medication, there may be an issue of a drug interaction with ingested CBD or cannabis.[12] In these cases, a topical that doesn't typically enter the bloodstream or a tincture that's absorbed directly into the blood without liver involvement may be better choices.

As always, it's important for clients to inform their health care providers about any supplements or botanicals they may be taking, including CBD and cannabis.

Legal Issues

Clients also need to concern themselves with the legalities of cannabis and CBD edibles. CBD can be extracted from both hemp and cannabis; however, CBD products derived from cannabis remain federally illegal. In addition, the FDA hasn't conferred Generally Recognized as Safe status to CBD and states that "it is currently illegal to put into interstate commerce a food to which CBD has been added." Regulations

are ever-changing and often vary state to state, so it's best to check the FDA website for updated information.[13]

Culinary Considerations

Once clients have educated themselves about the legalities, dosing and safety considerations, and possible drug interactions regarding edibles, they also can consider cooking with cannabis as part of their wellness routine. When using a tincture, clients can add a few drops to their favorite foods and beverages (ie, salad dressings, smoothies, or baked goods). To reap the most therapeutic benefit, it's important to be careful when applying heat. High heat (over 350˚ F) may result in the loss of terpenes, the aromatic compounds that work synergistically with cannabis to boost the therapeutic effects.

Home-grown cannabis or hemp can be used to make infused oil or butter for use in recipes. The dried flower must be decarboxylated (activated) first. This process naturally occurs when smoking or vaping cannabis. There are appliances on the market that also will decarboxylate cannabis flower and enable clients to make infused oils. The challenge clients will have when making their own infused oils is determining dosing.

Here's one method clients can use to decarboxylate their own cannabis or hemp flower for use in cooking using a standard oven, from Leafly.com.[14]

1. Set oven temperature to 225˚ F and place the oven rack in the middle position. Ovens are hotter at the top and cooler at the bottom, so placing it in the middle will ensure decarboxylation at the ideal temperature.

2. Cut a piece of aluminum foil to the size of a baking sheet and lightly crumple it, then lay it across the baking sheet. This will minimize the direct contact of the cannabis to the baking sheet, which conducts heat better than aluminum foil and will get hotter than the air in the oven.

3. Lightly break up the cannabis until it's about the size of a grain of rice (too fine of a grind increases the risk of burning). Spread the cannabis across the aluminum foil, then lightly lay another piece of aluminum foil on top. Place the baking sheet in the oven and bake for 45 minutes.

4. After 45 minutes, remove the baking sheet from the oven, and let it cool for 30 minutes at room temperature. The cannabis should look lightly toasted and golden brown.

5. When it's cool enough to handle, carefully put the decarboxylated cannabis into a storage container to use for future cooking. (The odor created by decarboxylating cannabis is quite pungent.)

Emily Kyle, MS, RDN, CLT, HCP, owner of Emily Kyle Nutrition, LLC, a communications and consulting company in Rochester, New York, has a helpful tutorial on how to make cannabis-infused coconut oil available at emilykylenutrition.com/cannabis-coconut-oil. This oil can be incorporated into a variety of recipes.

Implications for RDs

When discussing edibles with clients and patients, it's important to recommend they incorporate fat when cooking with cannabis or using an edible. Cannabinoids are fat-soluble, so they're better absorbed when consumed with a fat source or after a meal. Baked goods should be stored in a cool, dry place to avoid degradation of the cannabinoids and terpenes, and may be frozen for later use. Gummies, while popular, may not be the best choice since the duration of effect is shorter due to the lack of fat to aid in absorption. Consuming gummies with a handful of nuts will help with absorption and lengthen the effect.

Both THC and CBD may help stimulate appetite, so there's potential for increasing food intake and body weight in clinical populations, such as in people with HIV-associated wasting syndrome, anorexia nervosa, or cancer-associated cachexia. It also may be a useful tool for older adults who experience a decrease in appetite and body weight. THC increases ghrelin, the "hunger hormone," which boosts appetite and may promote fat storage. CBD may influence the areas of the brain that regulate food intake and enhance eating pleasure.[15] Despite stimulating appetite, the average BMI of daily cannabis users is about 3% lower than the general population.[16]

When discussing cannabis and helping clients choose a CBD or cannabis product, it's best to steer them towards products that are organically grown, since cannabis and hemp are bioaccumulator plants that draw toxins from the soil. Clean extraction methods avoid the use of solvents and preserve the components of the plant.[17]

Consumers should ask CBD companies for independent lab testing of their products to ensure that what's listed on the label is accurate. Studies by the FDA and the American Medical Association found that 70% of CBD products on the market were mislabeled, with some containing zero CBD.[18,19] If clients are concerned about potential employer drug testing, it's important to note that CBD products legally may contain up to 0.3% THC, which may be enough to trigger a positive drug test.

Four out of five doctors approve of medical cannabis, but 90% don't feel confident prescribing it. Surprisingly, only 10% of medical schools include cannabis education, and few dietetics internships teach about the benefits of medical cannabis.[20] Clients are looking for credible information, and RDs are in a unique position to offer nonjudgmental advice and counseling about the medical benefits of cannabis and CBD, in particular as it relates to gastrointestinal issues, inflammatory bowel disease and irritable bowel syndrome, pain, blood sugar control, and cancer treatment side effects.

Cannabis has been used medicinally for centuries with no reported cases of overdose.[21] According to the World Health Organization, "Across a number of controlled and open-label trials of the potential therapeutic effects of CBD, it is generally well tolerated, with a good safety profile." Dietitians need to be aware that more and more people are turning to cannabis and CBD to obtain relief for a variety of medical conditions. Therefore, it's incumbent on all RDs to listen and learn to better assist clients. Edibles are a convenient and discreet way to consume cannabis and CBD, but they're not appropriate for everyone. My hope is that RDs will join the effort to reduce the stigma and be open to cannabis and CBD as viable options in the treatment of many debilitating health conditions. ■

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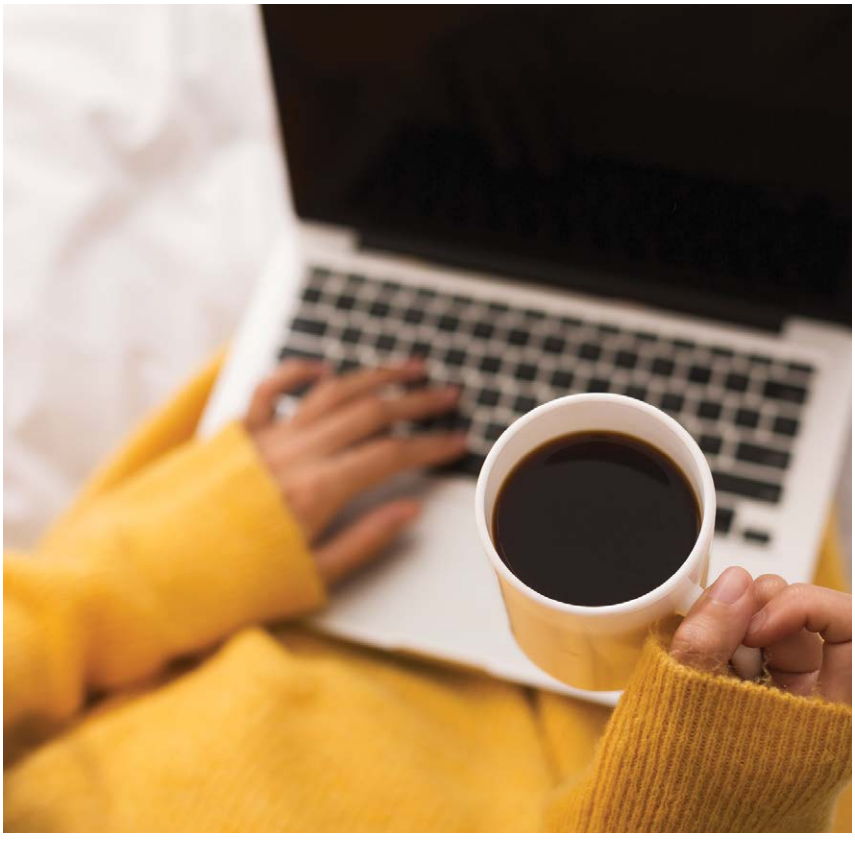

Coffee's Impact on Cognitive Function

Interest in the potential health benefits of coffee compounds is growing, especially concerning their impact on cognitive function. A good deal of research has shown that coffee, and its constituents chlorogenic acid (CGA) and caffeine, positively could impact cognitive function.

This continuing education course reviews coffee's effects on cognition, how its impact varies based on consumption patterns, its physiological and neurophysiological effects, and consumption recommendations.

Consumption Patterns and Recommendations

Coffee is one of the most widely consumed and popular beverages in the world.[1] Different brewing methods allow for different coffee preparations, including the drip method, percolation, pressurization to make espresso, and instant coffee made by mixing granules with hot water. While coffee is commonly used to start the day between 9 and 11 AM, consumption also peaks in the afternoon (1 to 3 PM) and decreases gradually into the evening. Consumption is also lower on weekends than weekdays.[2] Common reasons for drinking coffee include taste, energy, relief from warm or cold weather, and social connection. About 63% of Americans report having coffee each day.[3]

Guidelines for coffee intake are dependent on the daily recommendations for caffeine and given in milligrams of caffeine per day. Currently, the 2015–2020 Dietary Guidelines for Americans support that as much as 400 mg/day of caffeine is safe for most healthy individuals, equating to three to five cups of coffee at 8 oz per serving.[4] This lowers to 200 to 300 mg/day during pregnancy and 300 mg/day when breast-feeding; caffeine could cause spontaneous abortion when crossing the placenta in pregnancy due to potential impacts on endogenous hormone regulation, and it's expressed in breastmilk during lactation.[5-7] In Europe, safe levels are similar to the United States, with the addition of a "safe consumption in one sitting" guideline of 200 mg.[8] Common side effects of caffeine toxicity include increased heart rate, anxiety, poor sleep, and potential increases in blood pressure. For those prone to anxiety or panic attacks, these conditions can be intensified. However, symptoms don't always occur with the same dose or severity, so staying within the daily recommended values will limit these effects for the average person.[9]

Coffee Composition

More than a thousand compounds have been identified in coffee, including caffeine, chlorogenic acids, and tannins.[1] Per the USDA's FoodData Central, one 8-oz cup of coffee contains 11% DV for riboflavin, 6% DV for pantothenic acid, 95 mg caffeine, and 2 kcal. Comparatively, 1 oz of espresso contains 3 kcal, 8% DV for niacin, 6% DV for magnesium, 63 mg caffeine, and minimal riboflavin and pantothenic acid.[10,11]

Caffeine

Caffeine accounts for about 1% of the weight of coffee beans.[1]

An average 8-oz cup of coffee contains around 80 to 100 mg caffeine, and a 1-oz

COURSE CREDIT: 2 CPEUs

Learning Objectives

After completing this continuing education course, nutrition professionals should be better able to:

1. Examine the current research surrounding coffee's impact on cognition.

2. Assess the effect coffee has on cognitive performance at varying dosages of caffeine.

3. Identify the safe dosage recommendations for coffee per day in various populations.

4. Distinguish three ways coffee metabolism can be affected.

Suggested CDR Performance Indicators
8.1.4, 8.3.6, 10.4.2, 10.4.3

CPE Level 2

shot of espresso contains around 65 mg caffeine.[4] Decaf coffee contains 2 to 15 mg caffeine per 8-oz serving.[12] Most espresso drinks, such as cappuccinos and lattes, are, depending on the size, typically made with more than one shot of espresso, resulting in a higher caffeine content. Caffeine content also can range drastically depending on the origin of the coffee, the type of roast (such as robusta vs arabica), the brew method (eg, espresso, drip, or percolation), and the grounds-to-water ratio used in brewing. When specialty coffees were tested, the caffeine content of either drip coffee or espresso varied not only from store to store but also within the same store from day to day. For example, 16 oz of Starbucks Breakfast Blend ranged from 259.2 mg caffeine to 564.4 mg caffeine over a six-day period.[13]

CGAs

CGAs are the main class of phenolics found in coffee and contain no caffeine themselves. Specific CGAs in coffee include caffeoylquinic acid, feruloylquinic acid, and dicaffeoylquinic acid.[14] They've been studied for their potential to impact mood and cognition in both caffeinated and decaffeinated coffees. CGAs typically comprise ~10% of the weight of coffee beans.[1]

As CGAs are metabolized, their metabolites circulate in the body and have the potential for impact on brain function. The most common polyphenol in coffee from this group is 5-caffeoylquinic acid. In the stomach, it's hydrolyzed to caffeic acid and quinic acid before absorption by the gastrointestinal tract and metabolized to glucuronide and sulphate metabolites.[15]

CGAs also are found in tea, blueberries, and sunflower seeds, with lower amounts seen in Chinese parsley, potatoes, tomatoes, apples, pears, tobacco, and eggplant.[16] Beverages made from vegetables and fruits also contain CGAs, though these aren't consumed nearly as much as coffee.[17] CGA concentrations have been shown to be highest in light-roasted coffee compared with medium- or dark-roasted coffee, and the robusta species has been shown to contain more CGAs than arabica varieties.[18,19] As CGAs are in numerous foods and function as antioxidants, their possible cardioprotective and neuroprotective benefits have been an ongoing focus of research.[20]

Tannins

Tannins are found in coffee in varying amounts. There's been some concern about the effects of tannins on iron availability, as they've been shown to potentially inhibit iron's absorption by binding it in the intestinal lumen. However, long-term studies haven't shown significant changes in iron status when consuming tannins. While absorption can be reduced when tannins are consumed in isolation, such as in tea or coffee, they don't appear to impact iron bioavailability when consumed as part of a complex meal. This is thought to be due to the inclusion of iron enhancers, such as ascorbic acid within a meal, rather than only iron inhibitors.[21,22]

Compound Metabolism

The effects of coffee on the body and brain originate from numerous compounds, including caffeine and CGAs. Caffeine has a half-life of around three to five hours, so effects can be seen as soon as 15 minutes after consumption and may continue for hours, depending on the amount of coffee consumed and one's individual metabolic rate of coffee's compounds. Caffeine blood levels peak around 30 minutes post consumption, with 99% of caffeine absorption occurring in 45 minutes, while other coffee compounds can peak anywhere between 30 to 60 minutes and four to six hours after ingestion.[1,8] Peak CGA concentrations have been shown to occur at 40 minutes post consumption.[23]

Coffee and Adenosine

The main physiological reactions to caffeinated coffee are due to caffeine's impacts on the central nervous system through an antagonistic effect on adenosine, specifically adenosine receptors. Adenosine regulates the body in many ways. Within the central nervous system, it dilates cerebral vessels, aids

Caffeine Content by Coffee Preparation Method

Preparation Method	Caffeine Content
Drip coffee (8 oz)	80 to 100 mg
Espresso (2 oz)	~130 mg
Instant coffee (8 oz)	80 to 112 mg
Decaffeinated drip (8 oz)	2 to 15 mg
Cold brew	Varies; limited data

RESOURCES

1. US DEPARTMENT OF HEALTH & HUMAN SERVICES. DIETARY GUIDELINES FOR AMERICANS 2015–2020: EIGHTH EDITION. HTTP://HEALTH.GOV/DIETARYGUIDELINES/2015/GUIDELINES. PUBLISHED JANUARY 7, 2016.

2. SPILLING THE BEANS: HOW MUCH CAFFEINE IS TOO MUCH? US FOOD AND DRUG ADMINISTRATION WEBSITE. HTTPS://WWW.FDA.GOV/CONSUMERS/CONSUMER-UPDATES/SPILLING-BEANS-HOW-MUCH-CAFFEINE-TOO-MUCH. UPDATED DECEMBER 12, 2018.

3. CARRILLO JA, BENITEZ J. CLINICALLY SIGNIFICANT PHARMACOKINETIC INTERACTIONS BETWEEN DIETARY CAFFEINE AND MEDICATIONS. ***CLIN PHARMACOKINET.*** 2000;39(2):127-153.

in regulating cerebral blood flow, and regulates neurotransmitter release.[24,25] Of importance for energy production, it combines with phosphate to form adenosine triphosphate.

Caffeine inhibits the adenosine receptors A1 and A2A to subsequently decrease cerebral blood flow and oxygenation to the brain, upregulate various neurotransmitters, and constrict blood vessels.[1,26] The A1 receptor is involved in neural activation, while the A2A receptor is related to vascular and physiological effects.[8,26] While caffeine causes vascular changes due to its inhibition of adenosine, caffeine's impacts on the brain are thought to stem from a neuronal effect, including the changes in neurotransmitter production, rather than a vascular one.[27,28]

Physiological changes from antagonism include increases in systolic, diastolic, and arterial blood pressure; vasoconstriction of cerebral blood vessels; reduction of cerebral blood flow; and changes in cerebral oxygenated hemoglobin and deoxygenated hemoglobin.[26] Thirty minutes after a dose of coffee containing 200 mg caffeine, 12 male participants showed a 10% and 15% increase in systolic and diastolic blood pressure, respectively.[24] The same dosage also has been shown to decrease cerebral blood flow by approximately 30%.[29]

Cognition and Coffee's Effects

Cognition typically is measured through computerized assessment batteries, such as the Computerised Mental Performance Assessment System, for numerous cognitive functions including memory, attention, recall, processing speed, and logical reasoning. Examples of cognitive domains commonly tested include emotional processing, short-term memory, storage in long-term memory, retrieval from long-term memory, sustained attention, perceptual speed, cognitive flexibility, and susceptibility to cognitive interference within these test batteries. A commonly used test for cognitive flexibility is the Stroop Test, where color names are presented in different colors. The words are either presented where the name of a color and the color of its ink are the same or the name of a color and the color of its ink are different. For example, the word "red" would be written in any color other than red to make an incongruent pair. The participant has to say the color of the ink, not the color the word states, as fast and accurately as they can. They're then scored for reaction time, number of errors, and total responses.[26] One study included an assessment of driving ability using a driving simulation to test adherence to road rules, staying on track, and following directions.[1] Some studies also implemented electrophysiological testing.[25]

Mood has been measured using self-reported ratings for various descriptors, including alert, overall mood, tense, mental fatigue, relaxed, tired, jittery, calm, and content. In the studies examining mood, participants measured mood by rating their current status for each descriptor on a scale.

When assessing cognitive changes, it's important to separate treatments using caffeinated coffee vs decaffeinated coffee, as well as coffee that contains CGAs vs noncoffee caffeine sources that wouldn't contain these nutrients.

Caffeinated Coffee vs Placebo

Caffeinated coffee reduces self-reported tiredness, tenseness, and mental fatigue while increasing feelings of alertness and overall mood.[23] Compared with placebo, caffeinated coffee has been shown to increase alertness, vigilance, accuracy, and mood, and improve reaction time, mental fatigue, and tiredness 30 minutes after a 100-mg dose.[1,28] Cropley and colleagues found that coffee containing 167 mg caffeine was correlated with increased sustained attention, boosted alertness, and reduced delayed recall functioning compared with decaffeinated coffee in older males.[23]

Caffeine vs Placebo

Participants who consumed 200 mg caffeine after a study session showed no differences in recognition memory, but significant differences were found in memory consolidation due to improved recall 24 hours after the initial study session, compared with placebo.[29] The same caffeine dosage was associated with an increase in correct responses on a shifting attention test and shorter response times during a braking driving test. In the shifting attention test, the placebo group provided 52.2 ± 6.4 correct responses, while the group given 200 mg caffeine produced 55 ± 5.7 correct responses, a 5% difference. In the driving test, braking times decreased from 0.89 ± 0.12 seconds in the placebo group to 0.84 ± 0.08 seconds in the caffeine group, an average 5% reduction.[30] Even a smaller dose of 75 mg caffeine was associated with an increase in reaction time and overall mood, a decrease in cerebral oxygenated hemoglobin, and an increase in deoxygenated hemoglobin, the latter of which is thought to indicate neural activation.[28]

Decaffeinated vs Caffeinated Coffee

Decaffeinated coffee also has been shown to improve mood and alertness. Compared with placebo, decaf coffee was associated with improved attention and reduced tiredness, though not as much as caffeinated coffee.[1] These results signify potential positive effects of compounds other than caffeine, such as CGAs.

Differences in CGA Content

Cropley and colleagues found that high-CGA decaf coffee was associated with improved alertness and decreased mental fatigue more than regular-CGA decaf coffee in 20 males aged 53 to 79, supporting a potential dose-response relationship with CGAs.[23] However, CGAs in supplement form didn't show the same beneficial impact as an equal amount of CGAs in decaf coffee.[1-3] Therefore, further exploration is necessary to learn more about other compounds in coffee and their role in cognition, as well as their possible synergistic effect with CGAs that may lead to greater benefits than when taking the compound alone.

Chronic vs Acute Users

It's been proposed that chronic users of caffeinated coffee may experience withdrawal symptoms, such as reduced alertness, in studies requiring caffeine abstinence, and that these could impact study outcomes if not accounted for as confounding variables. However, when comparing habitual users with nonusers of caffeine, caffeine has been shown to increase alertness similarly.[1] Unfortunately, the definitions classifying nonusers, habitual users, and low and high users varies from study to study. For example, Haskell and colleagues defined habitual nonconsumers as those who didn't drink tea or coffee and consumed less than 50 mg/day of caffeine; habitual consumers were defined as drinking tea and/or coffee and more than 50 mg/day of caffeine.[28] Of "habitual drinkers," consuming more

than 300 mg/day usually is the threshold to differentiate high and low users.[31] Dodd and colleagues, on the other hand, defined habitual drinkers as those who consumed more than 150 mg/day of caffeine and nonhabitual drinkers as those who consumed less than 60 mg/day.[26]

As A1 receptors can be upregulated with chronic caffeine use, those who habitually consume caffeine could build up a tolerance to some of its effects over time, leading to questions of caffeine's ability to continue to impact cognition.[26] However, one study found that simple reaction time, digit vigilance, numeric working memory reaction time, alertness, and sentence verification accuracy still were increased when habitual consumers ingested caffeine, and these consumers' scores were better than nonconsumers' for spatial memory. Most of these benefits were seen at a 150-mg dose, while some occurred after only a 75-mg dose.[28] Both habitual and nonhabitual users experienced decreased ratings of tiredness and mental fatigue following a 75-mg dose. In one study, variances between nonhabitual users and habitual users showed that reaction times were significantly faster in habitual users, even though both groups improved following caffeine.[26]

While basal differences in heart rate and blood pressure haven't been observed between users and nonusers, caffeine intake was associated in one study with an increase in systolic blood pressure among nonusers, but not in habitual users. This may support the notion that habituation attenuates caffeine's negative effects on blood pressure.[32]

Metabolic Differences Among Users

Caffeine from coffee is absorbed in the stomach and small intestine and then metabolized by the liver with the aid of the cytochrome P450 enzyme system.[9] Its metabolic byproducts are excreted in the urine. Many studies have included baseline and posttreatment saliva testing to ensure compliance with caffeine abstinence and effective absorption and metabolism of caffeine into the body. It's important to note that variability exists in absorption and metabolism of caffeine and CGAs across individuals, and thus the amounts that end up in the brain. This is in part due to a polymorphism in the CYP1A2 isoform of cytochrome P450. Other polymorphisms in enzymes and brain targets for caffeine also can vary from person to person.[8]

Coffee and Thermogenesis

Research is mixed on the effects of caffeinated coffee and/or caffeine on energy expenditure. Studies generally have used small sample sizes and large doses of caffeine. Caffeine stimulates the sympathetic nervous system, an important regulator of energy expenditure, which may lead to an increase in resting energy expenditure (REE). One study of 12 young men found that 200 mg caffeine increased resting metabolic rate by 7% ± 4%; however, the study was small and limited to one sex and age range.[33] Another small study of eight participants showed that adding coffee that included 4 mg/kg body weight of caffeine (272 mg for a 150-lb reference person) to a 736-kcal meal increased the thermic effect by 10% compared with decaffeinated coffee, while consumption of 100 mg caffeine in a single dose increased basal metabolic rate by 3% to 4% for 150 minutes post consumption.[34-36] Dulloo and colleagues found that thermogenesis from caffeine could occur throughout the day if caffeine was consumed every two hours, six times per day (up to 600 mg throughout the day, which is well over the recommended daily caffeine intake). This level of consumption was associated with an insignificant 8% to 11% REE increase—150 kcal in lean subjects and 79 kcal in "postobese" subjects, defined as those who were once obese but were within a normal weight range at the time of the study.[36] Based on these results, caffeine's thermogenic effects are likely to be short-lived, insignificant, reversed as caffeine is cleared from the body, and different based on weight history.

Duration of Impacts and Dosing

Most studies on cognitive impacts tested participants at baseline and again at 30 to 45 minutes post consumption, so effects on cognition past this timeframe are unknown. Only one study tested memory function 24 hours post consumption.[29] In studies on thermogenesis, any increases in metabolic rate have been shown to return to normal rates at around 120 to 150 minutes post consumption.[35,37]

Cognitive changes have been seen with a caffeine dose as low as 75 mg, with more impact after a dose of around 200 mg. It seems that 200 mg is the minimum dose associated with memory consolidation effects, while improvements in reaction time, working memory, mood, and alertness were seen at 75 mg. Participants also experienced decreased self-reported tiredness and mental fatigue following a 75-mg dose.[28,29]

At-Risk Populations

Those who are pregnant or breast-feeding, smoke cigarettes, experience high blood pressure, and take certain drugs are at risk of negative impacts from caffeine.

Pregnant or Breast-Feeding

Those who are pregnant or breast-feeding need to use caution when consuming caffeinated coffee. During pregnancy, caffeine's metabolism slows, prolonging its half-life. The half-life is longest during the third trimester, lasting 11.5 to 18 hours compared with the normal 2.5 to five hours. In addition, the fetus and placenta can't metabolize caffeine, which can lead to caffeine accumulation in the fetus; as such, recommendations for maximum caffeine intake per day are set at 200 mg to 300 mg during pregnancy.[8] During lactation, caffeine is excreted with breastmilk, which can cause symptoms of overalertness in infants. The safe level for caffeine consumption during lactation is 300 mg per day.[5,6]

Cigarette Smokers

Cigarette smokers experience an increase in caffeine metabolism, with clearance double that of nonsmokers due to an increase in liver enzyme activity. Smoking cessation can slow caffeine metabolism by 36% compared with nonsmokers; thus, during the first few weeks of smoking cessation, caffeine intake may need to be lower than that of nonsmokers due to increased sensitivity.[8] Smoking behaviors should be assessed to determine the potential for increased caffeine potency in those who have recently quit smoking.

High Blood Pressure

Individuals with hypertension should consume caffeine with caution, as it can lead to increases in blood pressure. Blood pressure responses to caffeine are individualized based on sensitivity and dose

response. In a study of 24 healthy subjects, 75 mg caffeine had no effect on blood pressure 30 minutes post consumption.[26] In another study of healthy males, researchers observed 5% and 10% greater increases in systolic and diastolic blood pressure, respectively, compared with controls after consumption of 200 mg caffeine.[24]

Food and Drug Interactions

Because caffeine uses the cytochrome P450 enzyme system during metabolism, it can impact other drugs using that system. When both caffeine and these drugs compete for metabolism through the cytochrome P450 enzyme, caffeine can prevent these drugs from being metabolized.[9] Grapefruit juice has been shown to reduce caffeine clearance by 23% as it inhibits one of the P450 system enzymes.[8]

Known medication interactions with caffeine include allopurinol, antimycotic drugs, cardiovascular drugs, central nervous system drugs, H2 receptor antagonists, idrocilamide, methylxanthines, nonsteroidal anti-inflammatory drugs, oral contraceptives, estrogen replacement therapy, proton pump inhibitors, quinolones, psoralens, and phenylpropanolamine.[9] Caffeine can increase or decrease the effects of these drugs, inhibit their absorption, or reduce caffeine's clearance from the body. Oral contraceptives and cardiovascular medications have been shown to slow the clearance of caffeine from the body by potentially doubling caffeine's half-life.[8] Dietary and supplemental caffeine intake should be considered when assessing food-drug interaction risks.

According to the National Coffee Association's annual survey, the consumption of espresso, cold brew, and blended drinks is on the rise.[3] Those drinking coffee for energy also may use other energy-boosting beverages, supplements, or even drugs. When discussing daily food logs or 24-hour recalls with patients, an emphasis on items such as energy drinks and supplements may be needed to accurately assess total caffeine intake.

Caffeine Labeling

While the FDA requires added caffeine to be listed in a product's ingredient list, coffee contains intrinsic caffeine and so wouldn't qualify under this rule unless a coffee product has additional caffeine in its recipe. Caffeine content doesn't legally have to be listed on food labels, as caffeine isn't a nutrient, though companies can choose to disclose the caffeine content, as many soda and energy drink manufacturers have done.[38]

Research Considerations

Cardiac issues, psychotropic medications, history of neurological or psychiatric disorders, and clinically high blood pressure were common exclusion criteria in many of the studies assessed.[23] Due to these restrictions, it's unknown how coffee could impact cognition in these populations.

There are several confounding variables and sources of potential bias in results of studies discussed in this course. Tiers of self-reported caffeine intake are inconsistent across studies, with varying definitions for "nonusers," "low users," and "heavy users." Furthermore, self-reporting, which was used for not only caffeine intake but also factors such as mood in many studies, is known to have low validity due to forgetfulness of respondents and lack of serving size knowledge. In addition, most studies didn't adjust results for cigarette smoking, which affects caffeine metabolism.

Sample sizes were consistently within a range of eight to 70 participants, with most on the lower end of that range. Some studies only included one sex and age range, while others were more equally distributed. Larger and more diverse sample sizes could show different results.

The quantity of coffee, type of brew method, and amount of water used varied across studies, and some sourced caffeine from supplements rather than coffee or espresso. Caffeine dosage differed across both caffeinated and decaffeinated preparations. Furthermore, while most coffee consumers order specialty drinks at coffee shops or make their own at home, the coffees tested were extremely standardized and didn't mimic the realistic variable nature of coffee brewing at home or in retail.

Many consumers add various sweeteners and/or creamers to coffee drinks. Whole milk hasn't been shown to impact the bioavailability of the phenolic acids, such as CGAs, in instant coffee, but it's unknown how other milk or creamer products or caloric or noncaloric sweeteners could alter the bioavailability of coffee compounds.[23] Foods consumed at the same time as coffee, or caffeine being consumed within a food or beverage, also can change bioavailability.[8] In addition, cognitive improvements associated with caffeine were negated when caffeine was combined with L-theanine, supporting a strong potential for a modulatory effect on cognitive outcomes due to other compounds.[26]

Putting It Into Practice

Both caffeinated and decaffeinated coffee have been shown to have cognitive impacts. Most notably, caffeinated coffee has shown improvements in alertness, attention, mood, processing speed, and reaction time, while decaffeinated coffee has been shown to improve both alertness and mood. Clients seeking neurostimulation safely can use coffee to improve these cognitive functions within the safe daily recommended levels for caffeine. However, the improvements noted in many studies may not be noticeable in day-to-day activities, such as braking times or reductions in mental fatigue. While alertness and mental fatigue improved after 75 or 150 mg of caffeine, it's unknown how these improvements translate into behavior changes, productivity, or other actions, as no specific improvement data were given. While cognitive changes are statistically significant, they may not be significant enough to translate into true day-to-day impacts on behavior. Before recommending coffee to clients to improve cognition, more research must determine the extent of behavior change one can expect and provide more support for coffee's positive relationship with cognitive function. RDs can remind clients of the wealth of research showing that lifestyle changes, including consuming fruits and vegetables, adequate sleep, proper hydration, and stress management can improve the body's—and brain's—health and performance. ■

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CPE Monthly **Examination**

1. Caffeine's half-life is slowed by which of the following?

a. Consumption on an empty stomach
b. Cigarette smoking
c. Oral contraceptives
d. The time of day it's consumed

2. Caffeinated coffee and decaffeinated coffee both have been shown to affect which of the following components of cognition?

a. Mood
b. Processing speed
c. 24-hour recall
d. Auditory processing

3. Caffeinated coffee typically contains about what amount of caffeine per 8 oz?

a. 50 mg
b. 100 mg
c. 150 mg
d. 200 mg

4. Caffeinated coffee is ___% caffeine by weight and ___% chlorogenic acids.

a. 5, 15
b. 10, 1
c. 3, 15
d. 1, 10

5. What is the daily recommended maximum for caffeine per day in healthy adults?

a. 200 mg
b. 400 mg
c. 600 mg
d. 800 mg

6. During pregnancy, safe daily caffeine levels are reduced to what amount?

a. 0 mg
b. 50 to 100 mg
c. 200 to 300 mg
d. 300 to 400 mg

7. What's the main class of phenols found in coffee?

a. Tannins
b. Catechins
c. Diterpenes
d. Chlorogenic acids

8. Caffeinated coffee stimulates the nervous system and is associated with subsequent physiological effects through its inhibition of which of the following?

a. Adenosine
b. Dopamine
c. Norepinephrine
d. Serotonin

9. Caffeine is metabolized by the cytochrome P450 enzyme system, which is impacted by which of the following foods?

a. Grapes
b. Bananas
c. Broccoli
d. Grapefruit

10. What are the labeling regulations for caffeine content on food products?

a. All caffeine, intrinsic or extrinsic/added, is under voluntary disclosure.
b. Intrinsic caffeine doesn't have to be labeled, but any extrinsic/added caffeine must be included within the ingredients list.
c. If a food product contains caffeine, it must be disclosed.
d. Caffeine levels must be labeled only if they exceed the safe daily limit of 400 mg.

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Group Fitness Adjusts to a New World

In late 2019, the American College of Sports Medicine (ACSM) published its top trends for the fitness industry in 2020. After experiencing a resurgence in popularity over the last several years fueled by new class formats, such as various types of dance fitness and high-intensity interval training, group fitness was ranked at No. 3.[1]

For many gyms and boutique fitness studios, group fitness class fees and memberships are a substantial source of revenue. While the increasing availability of on-demand online classes has helped boost popularity, the long-lasting popularity of group fitness classes—and the willingness of participants to spend money on them—is due to the energy from the instructor and participants, feelings of camaraderie, socialization, and motivation associated with in-person classes.

The ACSM couldn't have predicted the coronavirus pandemic, nor that fitness would be one of the most impacted industries. With mandatory shutdowns for months, many fitness facilities have faced revenue losses that will affect future operations. So what has been the effect of the pandemic on group fitness? And, is it safe to go back to in-person fitness classes while there's still no proven treatment or vaccine for COVID-19?

An Evolving Business Model

When closed, many facilities that relied on group fitness introduced live streaming or recorded their most popular instructors and classes for home workouts. However, numerous workouts already are available for free online, and group fitness instructors and facilities charging fees for online participation face strong competition. Participants who are committed to socializing with other class members and loyal to their favorite instructors have driven the creation of live online classes using platforms such as Zoom and WebEx, designed primarily for business and traditional education, not fitness. Necessity drives invention, though. The pandemic has created innovation in the group fitness industry with new apps and platforms for instructors and facilities to run online workouts and track participation and revenue. In online instructor support groups, many instructors have reported success with maintaining their class attendance, especially those who serve higher-risk participants such as older adults, who see online classes as safer and more convenient to attend.

In the United States, in early summer, gyms in many states had reopened, but resuming group fitness classes varied widely among facilities and geographic areas. Some facilities were offering only outdoor classes; others were offering indoor classes, but only with significantly reduced class sizes due to distancing requirements. The future of gym workouts, and especially group fitness classes, which typically involve many participants packed into one room, is uncertain due to the contagiousness of SARS-CoV-2 and the high numbers of cases in many states.

A late June 2020 poll of 2,000 American adults who exercised at gyms at least twice per week showed that gym and group fitness class participation may be negatively affected in the following ways for at least the near future[2]:

- About one-quarter of respondents replied that they won't be returning to the gym at all.
- One-third said they'll keep their membership but will go less frequently than they did before the pandemic.
- About one-half of respondents planned to wait four to five weeks before returning to gyms.

An overwhelming 83% of respondents said they'd feel more comfortable at a gym that requires everyone to wear masks (most gyms are requiring masks to be worn when not exercising, but very few require masks be worn during exercise). While the primary deterrent for returning to gyms was risk of infection, about 40% of respondents said they now prefer their home gym equipment and at-home class exercise options over gym workouts.[2]

In areas where gyms have reopened, is it even safe to exercise indoors in a group fitness setting? Fitness settings haven't been well researched in terms of virus transmission. One study published in August 2020 by South Korean researchers reported significant virus spread early in the pandemic as a result of an instructor fitness training workshop in February. Of 27 instructors attending a four-hour dance fitness instructor training, eight tested positive for COVID-19 a few days after the workshop; all were asymptomatic on the day of training. Contact tracing by the researchers identified 112 subsequent COVID-19 cases spread by the instructors who taught the week after the workshop, some with mild virus symptoms (eg, coughing). Instructors and students had contact only during 50-minute classes twice weekly. Approximately 50% of the cases were transmitted by instructors to students, who then transmitted

the virus to family members (34% of cases). Infected family members then transmitted the virus to coworkers or friends (15% of cases).[3]

Other findings and conclusions from the researchers include the following[3]:

- Large, high-intensity classes held in small rooms likely contributed to virus spread via exhaled respiratory droplets.
- No cases were found among students in smaller, less intense yoga and Pilates classes held in a different room in the same facility at the same time as the dance fitness classes. The researchers speculated that lower-intensity exercise with less heavy breathing among a smaller class didn't provide conditions as ideal for viral spread.

The Way Forward

This research, coupled with the expertise of infectious disease professionals, has led to the following recommendations for gym goers and group fitness participants who want to return to prepandemic exercise routines at fitness facilities:

- Group fitness participants should base decisions on their individual risk of complications from COVID-19. Anyone at greater risk of severe complications should limit exercise to outdoor settings or their home.
- Indoor gyms and classes have the potential to easily spread the virus to multiple individuals, depending on the number of exercisers, intensity of exercise, and ventilation.
- Likelihood of infection from a gym or class workout is greater in areas with higher community spread of SARS-CoV-2. The more people in the community who have tested positive, the greater the likelihood of encountering those who are asymptomatic and presymptomatic and being exposed to the virus.
- The lowest-risk group fitness setting is outdoor classes with participants at least six feet apart who use their own equipment. Larger classes and shared equipment increase risk, even outside.
- Risk in indoor classes depends on room size, number of participants, physical distancing, masking, and ventilation. Although wearing masks during high-intensity exercise can be uncomfortable, it decreases the risk of spreading and inhaling infected respiratory droplets. Facilities that have frequent air exchange with fresh outside air also reduce the risk of lingering virus particles in the air.

Before the pandemic, group fitness was on track to experience rapid growth. For the time being, any growth is likely to be in online and outdoor classes (where weather permits). Future growth will depend on the development of effective treatments and vaccines. ■

Jennifer Van Pelt, MA, is a certified group fitness instructor and health care researcher in the Lancaster, Pennsylvania, area.

For references, view this article on our website at www.TodaysDietitian.com.

Refrigerated Plant Protein Bars

Bright Bar, a maker of fruit- and vegetable-based bars, unveils a line of refrigerated protein bars called Clean Protein. Available in Peanut Butter, Peanut Butter Chocolate, and Chocolate Sea Salt varieties, the bars are made with fruit and vegetable powders; protein derived from pumpkin seeds, brown rice, and peas; and prebiotic fiber from tapioca. Each bar contains 280 kcal and 4 g added sugars, and is an excellent source of protein and fiber. All varieties are Non-GMO Project Verified, vegan, gluten-free, and soy-free.

brightfoods.com

Coconut Beverages, Yogurt Released

Harmless Harvest releases a line of Flavored Coconut Water in Cucumber Mint, Watermelon, and Strawberry Rose varieties. All are a good source of potassium and phosphorus and are USDA Organic and Fair for Life Fair Trade. Harmless Harvest also rolls out a line of Organic Dairy Free Coconut Yogurt Alternative in Plain, Strawberry, Blueberry, and Vanilla varieties, each of which is a good source of fiber per 4.4-oz container. The yogurt is vegan, soy-free, USDA Organic, and 92% Fair for Life Fair Trade.

harmlessharvest.com

Steamable Seafood Meals and Bowls

Aqua Star, a maker of a wide variety of seafood products, introduces MicroSteam Bowls and Meals, a new line of frozen microwaveable seafood meals. Bowls include Shrimp & Grits, Shrimp Ramen, Shrimp Scampi, Shrimp Pad Thai, Salmon Teriyaki, and Sesame Ginger Wild Alaskan Pollock. Meals include White Wine Shrimp, Roasted Garlic Salmon, BBQ Sriracha Wild Salmon, Lemon Herb Wild Cod, and Cajun-Style Tilapia. Bowls contain 220 to 330 kcal. All are an excellent source of protein, some are a good source of fiber and iron, and Salmon Teriyaki is an excellent source of vitamin D. Meals contain 420 to 490 kcal. All are an excellent source of protein and a good source of iron; some are a good to excellent source of fiber, calcium, potassium, and vitamin D. All bowls and meals are certified through Best Aquaculture Practices.

aquastar.com

Liability Insurance for Wellness Professionals

ProSight is a liability insurance provider that offers plans for a variety of wellness practitioners, including RDs. Incidents such as third-party property damage, third-party bodily damage, and legal defense are covered. ProSight features access to an online self-service portal for claims and other services, worldwide liability protection, no broker or membership fees, and more.

prosightdirect.com

Datebook

The following information reflects the original dates and locations of these events. Please check with each organization for the most up-to-date information. Note that some events may feature virtual components.

OCTOBER 5-9, 2020
American Society for Parenteral and Enteral Nutrition Malnutrition Awareness Week
www.nutritioncare.org/3MAW

OCTOBER 14-18, 2020
National School Lunch Week
http://schoolnutrition.org

NOVEMBER 2-6, 2020
The Obesity Society ObesityWeek® 2020 Interactive
https://obesityweek.org

NOVEMBER 13 – DECEMBER 14, 2020
Register Now for the Virtual 2020 Renfrew Center Foundation Eating Disorders Conference for Professionals — Feminist Relational Perspectives and Beyond: Lessons Learned
Featured Speaker: Lori Gottlieb, ***The New York Times*** Best-selling Author
Online Registration OPEN
Contact: Kaitlin McFadden
Phone: 1-877-367-3383
E-mail: kmcfadden@renfrewcenter.com
www.renfrewconference.com

JANUARY 10-12, 2021
School Nutrition Association School Nutrition Industry Conference
Tampa, Florida
http://schoolnutrition.org

FEBRUARY 26 – MARCH 1, 2021
American Academy of Allergy Asthma & Immunology Virtual Annual Meeting
www.aaaai.org

MARCH 8-12, 2021
National School Breakfast Week
http://schoolnutrition.org

MARCH 20-23, 2021
American Society for Parenteral and Enteral Nutrition Virtual Nutrition Science & Practice Conference
www.nutritioncare.org

MARCH 29 – APRIL 1, 2021
American Society of Preventive Oncology 45th Annual Meeting
Tucson, Arizona
https://aspo.org

APRIL 15-17, 2021
California Academy of Nutrition and Dietetics Annual Conference & Expo
Irvine, California
www.dietitian.org

APRIL 29 – MAY 1, 2021
School Nutrition Association National Leadership Conference
Seattle, Washington
http://schoolnutrition.org

MAY 27-30, 2021
American Diabetes Association 35th Annual Clinical Conference on Diabetes
Ponte Vedra Beach, Florida
https://professional.diabetes.org

JUNE 1-5, 2021
American College of Sports Medicine 68th Annual Meeting
Washington, D.C.
www.acsmannualmeeting.org

JUNE 25-29, 2021
American Diabetes Association 81st Scientific Sessions
Washington, D.C.
https://professional.diabetes.org

JULY 11-13, 2021
School Nutrition Association Annual National Conference
Chicago, Illinois
http://schoolnutrition.org

JULY 24-27, 2021
Florida Academy of Nutrition and Dietetics Florida Food & Nutrition Symposium
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Carlene Thomas

Mastering the Art and Science of Media

Carlene Thomas, RDN, LD, says there was never a time when she thought clinical work was the right path for her—even when professors were telling her otherwise. She always had this desire to be part of a creative world where she could formulate messages and "tell a story." She just wasn't sure exactly what that looked like. A decade ago, the social media scene and content creation for nutrition and dietetics—eg, recipes and cooking videos, photography, and art direction and graphic design for advertising and branded content—wasn't what it is today.

So, Thomas got on Twitter and started experimenting, and then received an invite to Pinterest when it was in beta mode. This was when she realized how essential pictures are to storytelling and the content she was creating. The birth of Instagram in late 2010 sealed the deal; she and her husband (then boyfriend), Chris, had been creating visual work—but now the phone was ringing. Big-name clients wanted Thomas to create visual work for them.

In 2011, Thomas founded Healthfully Ever After, LLC, a content creation company that works with food and beverage brands that focus on digital platforms. In their business, Thomas formulates engaging messages and her husband, who joined the business in 2015, brings them to life through video, photography, and design. This has included not just social media campaigns but also packaging and graphic design projects. For example, Thomas and her husband designed a digital "umami scouting" map for a client at FNCE® last year that showed a handful of restaurants on a map with their facades and a recommendation for what to order.

Healthfully Ever After's clients also have included Dole/Disney, Almond Breeze, siggi's, Sunkist, and Unilever. Thomas also authored *CBD Drinks for Health*, which was published in January, and she's a past president of the Virginia Academy of Nutrition and Dietetics Board of Directors.

Thomas and her husband reside in Northern Virginia where Thomas might be found honing her archery skills or tending to her garden when not busy with content creation.

***Today's Dietitian* (*TD*): You're known for content creation. What do you love most about this type of work?**

Thomas: I love that we can take a concept from anywhere—architecture, typography, gardening—and we can pull that into telling a better story about food. When we started out with visual work, we were really doing it for fun. But we kept getting asked, "Can I hire you for that?" It was

clear that what we were putting out was sparking demand. An early project, circa 2011, was just a recipe creation with recipe photography. It used to be [that] to photograph a recipe you would have a recipe creator, a food stylist, a prop stylist, a photographer, and sometimes even a separate photo editor. But for a brand to use just one company, [with only] Chris and I, made a more streamlined process. From there, we moved into recipe videos.

***TD*: You have had some big-name clients. What are some of your most memorable projects, and how do you keep pushing the envelope to develop good ideas for your clients?**

Thomas: The first time we had a piece go up on FoodNetwork.com was really memorable. It was a wedding-specific project and we did a series of photos of food and bouquets and centerpieces. Our collaboration with Dole and Disney also was really exciting—seeing the video we made go up on their social media sites and start getting thousands of views. We were brought on to create recipe videos and images that Disney and Dole created for movies that were coming out. The first one was a Dole Whip creation for the movie *Moana*. I think that might be the first time our families really understood what we were doing. In terms of pushing the envelope, I have to give a lot of the credit to my husband, whose background is in creative design. He has ideas sometimes that I can't always see right away but I trust his vision. He is amazing at trend forecasting, and that's really helped us stay ahead of the curve.

***TD*: How do you and Chris share the work in order to be productive, and what have you learned working as part of a husband/wife team?**

Thomas: It's a "divide and conquer" situation, each focusing on what we're best at. I'm the logistics and the contracts person, and I'm usually the one on camera. Chris is focused on video and photo editing and graphic design concepts. We play to one another's strengths. I should say that before we were married, we were best friends. We have a long history of working well together and we love spending time together. Before Chris came on full-time, he was already helping with the business. I trust him completely and I know he's going to tell me the hard truth, not just what I want to hear. Ultimately, we want the same thing—to have an amazing result and build a great business—so we're on the same page, and that's important.

***TD*: As a successful content creator, what advice do you have for other dietitians who are interested in this area?**

Thomas: My best advice is to put out into the world the kind of project that you want to be hired for. That's the way we started. We were already shooting in a style of video before it became really popular—and we were putting it out there. Don't wait to get hired; you have to show them what you can do first. We're always trying to stay ahead of the curve and do something new. With that said, we don't always do everything new. Take TikTok, for example—it's just not us. It's okay to let new things pass by without participating.

We recently went back to Copenhagen just to eat. We booked our table at Noma and then we booked our flight.

***TD*: You also create a lot of recipes that you offer for free on your website. What inspires your ideas, and what is the nutrition philosophy behind them?**

Thomas: We have a running list of ideas at all times. A lot of it comes from travel. We recently went back to Copenhagen just to eat. We booked our table at Noma and then we booked our flight. In terms of our focus, if you're looking for recipes with five-ingredient crockpot meals, that's not us. That's not to say that sometimes our recipes won't be really simple, because sometimes they are. But we're looking for great ingredients that go really well together—and use the best possible cooking methods, too. That may mean cooking steak sous vide if it's going to get you results that are substantially better. That also sometimes means using full-fat ingredients, which I know is shocking to some since I'm a dietitian. But it goes back to 'How do you make the best possible version of this food?' If I can add a little bit of cheese and it makes the dish highly craveable, I'm going to do it. For instance, if I make a whole plate of Brussels sprouts and add some parmesan cheese and some bacon—and the entire thing gets eaten—I'd rather that than some steamed Brussels sprouts that nobody really wants. I think it opens the door for eating more produce and for enjoying what you eat.

***TD*: If we could get a sneak peek into your kitchen, what would we find?**

Thomas: You'd definitely find lots of nosey cats—we have five! But you'd also find plenty of spices and condiments. We use a lot of seasoning agents for cooking. You'd also find every Bob's Red Mill flour variety there is, which we love for recipe testing. That's a staple for me. I've also gotten really into gardening in the past year, and my kitchen is starting to be filled with fresh produce from the garden. In terms of what we're eating, we love and can't stop eating fennel salad. We'll create a raw bowl with some fennel [sliced] on the mandolin, with some kind of acid and a little spice and herb. That's basically our side dish for anything we're eating.

***TD*: What do you like to do for fun?**

Thomas: To be honest, our hobby is our work—we really do love making food and creating new things—so that's what you find us doing for fun, too. We'll go all out when we have people over. Earlier this year, we had friends over for a birthday and Chris created a custom menu with branding and we created a themed tablescape. I also love gardening and I recently got back into archery. When I was in high school, I trained with a former Olympian. Chris convinced me to pick it back up again and it's been fantastic for some mental clarity time. Archery helps train your brain. We also have a historic home that we are renovating, which is how Chris spends a lot of his free time—scraping 100 years of paint off windows and working hard to restore something beautiful. ■

Lindsey Getz is an award-winning freelance writer based in Royersford, Pennsylvania.

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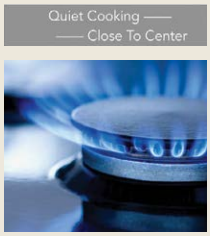

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School Food and Physical Activity Environments May Impact Childhood Obesity

Students at elementary and secondary schools that offer more healthful food offerings and more opportunities for physical activities have a lower BMI, according to Rutgers researchers.

The study, published in *Preventive Medicine Reports*, uses professional measures of students' height and weight—the gold standard for studying childhood obesity—in a study on the effects of a school's food offerings and physical activity environment.

Almost 1 in 5 children and adolescents in the United States have obesity. Since children eat as many as two meals per day and can get 40% of their daily physical activity at schools, schools play a major role in obesity-related behaviors. Although recent policies and programs, such as the National School Lunch Program, have focused on promoting more healthful school environments, there's little evidence of the consequences for children's weight.

Over the period of one school year, the study looked at the healthfulness of items offered in school lunches, vending machines, and other school food offerings. It also examined the number of indoor and outdoor physical activity facilities and physical activity opportunities at 90 public schools that serve 19,000 students in Newark, Trenton, Camden, and New Brunswick, all cities in New Jersey.

Researchers found that more healthful food offerings and a greater number of physical activity facilities were associated with lower BMI, on average, for students. Schools that offered an additional unhealthful item in vending machines were associated with higher student weight, and those that had an additional outdoor physical activity facility correlated with lower student weight.

"Evidence of the importance of school meals and of enforcing healthful nutritional standards is particularly timely given current federal proposals to roll back those standards," says Michael Yedidia, PhD, MPH, who codirects the New Jersey Child Health Study at the Rutgers Center for State Health Policy. "These meals are critical to the health of low-income students, who are 80% of those served by federal school meals programs. They provide up to half of the students' nutritional needs at low or no cost to parents."

The findings will be particularly relevant for discussions on Child Nutrition Reauthorization, the key piece of federal legislation that supports school food programs, says Punam Ohri-Vachaspati, PhD, RD, a study coauthor at Arizona State University. "Schools play a critical role in providing environments to support healthful habits among children that can influence their short- and long-term health," she says.

SOURCE: RUTGERS UNIVERSITY-NEW BRUNSWICK

Kabobs for Dinner

Simple and Versatile Meals on the Grill

October in the South, where I live, brings (finally) cooler weather. It's the ideal time to enjoy being outside, and we eat almost every meal on our backyard deck. Grilled kabobs are one of our go-to meals because we can prepare a nutritionally balanced, complete meal on the grill, and the possible ingredient variations are endless.

Building a good kabob starts with choosing a protein. Grilling is a dry, high-heat cooking method, so it's important to choose a tender cut of meat, which will become juicy. Save tougher cuts of meat with more connective tissue for moist-heat cooking methods, such as braising or stewing. When it comes to beef, I prefer sirloin, which is tender and flavorful, as well as a lean protein choice; for pork, tenderloin or chops work well. Boneless, skinless chicken thighs retain more moisture than breasts. For seafood, shrimp are an obvious choice. Cut the protein of choice into 1- to 1½-inch chunks, ensuring the pieces are about the same size for even cooking.

Next, decide whether to marinate the protein. A marinade can add a punch of flavor, or simply use salt and pepper to enjoy the taste of the grilled meat. Choose a flavorful marinade for tofu, which is bland on its own. Always store meat that's marinating in the refrigerator, and discard the marinade or bring it to a rolling boil if you plan to use it on the cooked kabobs.

Round out your kabobs with vegetables and/or fruits for added color and nutrients. Choose vegetables and fruits that will cook in about the same amount of time as the protein. For example, chunks of beef, bell peppers, whole mushrooms, and pineapple all can be grilled on the same skewer. Shrimp pairs well with quick-cooking vegetables, such as grape tomatoes and zucchini.

When it comes to skewers, I opt for metal, which are reusable and don't require any prep. If you choose wooden skewers, soak them in water for at least 30 minutes to prevent the ends from burning. Grill the kabobs, turning occasionally, until the meat reaches the safe cooking temperature.

With lean pork, tart apple, and a sweet and tangy basting mixture, these skewers are perfect for a fall cookout. Serve alongside skewered grilled potatoes or over a bed of wild rice. ■

Jessica Ivey, RDN, LDN, is a dietitian and chef with a passion for teaching people to eat healthfully for a happy and delicious life. Ivey offers approachable healthful living tips, from fast recipes to meal prep guides and ways to enjoy exercise on her website, JessicaIveyRDN.com.

Grilled Pork and Apple Kabobs

Makes 6 servings

Ingredients

1½ lb pork tenderloin, cut into 1-inch pieces (or use beef sirloin roast or steak)
1 T chopped fresh rosemary
1 tsp onion powder
¼ tsp garlic powder
¼ tsp salt
¼ tsp black pepper
2 Granny Smith apples, cut into 1½-inch chunks
¼ cup maple syrup
2 T Dijon mustard
1½ tsp olive oil

Directions

1. Preheat grill to medium-high heat. Combine pork, rosemary, onion powder, garlic powder, salt, and pepper in a bowl and toss to coat. Thread pork and apples alternately onto 6 (12-inch) metal skewers.

2. Stir together maple syrup, Dijon mustard, and olive oil in a small bowl. Set aside.

3. Grill skewers 8 to 12 minutes total, turning occasionally. Baste with maple syrup mixture during the last 3 minutes of cooking, turning every 1 minute. Cook skewers until a meat thermometer inserted into the center of a piece of pork registers 145° F.

Nutrient Analysis per serving

Calories: 200; Total fat: 4 g; Sat fat: 1 g; Cholesterol: 60 mg; Sodium: 270 mg; Total carbohydrate: 17 g; Dietary fiber: 2 g; Sugars: 13 g; Protein: 22 g

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1. Krebs-Smith SM, Guenther PM, Subar AF, Kirkpatrick SI, Dodd KW. Americans do not meet federal dietary recommendations. J Nutr. 2010;140:1832–38. 2. U.S. Department of Agriculture and U.S. Department of Health and Human Services. Dietary Guidelines for Americans, 2015. 8th Edition, Washington, DC: U.S. Government Printing Office, 2015. 3. Dietary Guidelines Advisory Committee. 2015. Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans, 2015, to the Secretary of Agriculture and the Secretary of Health and Human Services. U.S. Department of Agriculture, Agricultural Research Service, Washington, DC..
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