

# Today's Dietitian

February 2025

The Magazine for Nutrition Professionals

## An Update on **Nonnutritive Sweeteners**

*Benefits, Risks, and Recommendations*



**L-carnitine  
and CVD**

**Transforming  
Hospital  
Food Culture**

**The Traditional  
Flavors of Mexico**

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# Contents

VOLUME 27 • NUMBER 2

FEBRUARY 2025



22



10

## DEPARTMENTS

- 4 Editor's Spot
- 6 Ask the Expert
- 5 Research Brief
- 8 Cultural Foodways
- 10 Food Service Forum
- 12 Ready, Set, Dietetic
- 34 Focus on Fitness
- 36 Get to Know ...
- 38 Datebook
- 40 Culinary Corner

## FEATURES

14 **An Update on Nonnutritive Sweeteners** Nonnutritive sweeteners, including stevia, monk fruit, sucralose, sugar alcohols, and aspartame, remain popular in foods and beverages. Discover how research and dietary recommendations for these nonnutritive sweeteners have evolved in recent years.

18 **L-carnitine and CVD** The research on L-carnitine supplements is mixed. *Today's Dietitian* examines studies that suggest it's both beneficial and detrimental for CVD risk and speaks to experts who share guidance for nutrition recommendations.

22 **Transforming Hospital Food Culture** Food Is Medicine programs promote plant-forward diets postdischarge, modeling healthful eating for patients and staff. Learn how serving diverse, plant-based options in hospital settings fosters cultural inclusion, and benefits personal health and environmental sustainability.

26 **CPE Monthly: Gastroparesis: An Update** This continuing education course examines the etiology, symptoms, and treatment of gastroparesis. It explains the role of the care team in utilizing MNT and nutrition support for gastroparesis.



26

# Today's Dietitian

## Interpreting Conflicting Results in Nutrition Studies

**I**t's no secret that conducting quality research in nutrition science is among the more difficult tasks. The highly interdependent system of metabolic pathways and biochemical processes inside a living body, each guided by many known and unknown factors such as genetics, dietary composition, the microbiome, lifestyle, and countless other environmental inputs, resists over-simplified reductionistic study designs. Isolating variables is a cornerstone of good science in one way, though removing too much of the context surrounding a subject of interest might not paint an accurate picture of how it functions and may mislead researchers in determining its impact on health outcomes.

Nutrition research is fraught with contradictory findings. Traditional study methodology—often highly reductionistic or linear—may ignore or minimize the contribution of other players in the system, including nonlinear phenomena like dose-dependent responses, which may make the difference between a given compound in question helping or harming. In nutrition science, this is never clearer than with nutrients themselves. As a common example, iodine deficiency is known to cause goiter; excess iodine will cause the same. If we snapped a separate photo of either moment, iodine would become the hero in the first and villain in the second.

In February's issue, *Today's Dietitian* features two articles unintentionally highlighting the challenge in nutrition research just described. In "L-carnitine and CVD," we see the paradoxical action of L-carnitine as an agent of risk on one hand and therapeutic aid on the other, depending on a variety of factors. In "An Update on Nonnutritive Sweeteners," we once again see the variable of dose play a part in determining potential risk.

Also in this issue, I am excited to introduce one of our new regular departments of 2025, Cultural Foodways. Celebrating the rich diversity of cultural traditions and tastes will take us around the world. Kicking it off, we'll look at the seasonings and flavors of Mexico, appreciating the influence of its seven distinct culinary regions.

I hope you enjoy this month's issue!

—Heather Davis, MS, RDN, LDN  
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## At Risk of High Cholesterol? Taking Fish Oil May Help

**Fish oil supplements** are a multibillion-dollar industry in the United States and abroad, with about two out of every 25 people popping the popular omega-3 pills.

And a new study from the University of Georgia (UGA) might encourage a new population to start looking into the supplements as well: people with a genetic predisposition to high cholesterol.

Using genetic data from more than

441,000 participants, the researchers calculated a score to predict the genetic likelihood of high levels of total cholesterol, high LDL cholesterol (which is often referred to as “bad” cholesterol), triglycerides, and HDL cholesterol (or “good” cholesterol).

“Recent advances in genetic studies have allowed us to predict someone’s genetic risk of high cholesterol,” says

Yitang Sun, PhD, a recent doctoral graduate from UGA’s Department of Genetics. “But the current prediction has room for improvement because it doesn’t consider individual differences in lifestyles, such as taking fish oil supplements.”

The researchers found that participants who reported taking fish oil supplements had lower blood lipid levels than predicted, especially for total cholesterol, LDL cholesterol, and triglycerides.

“Our study shows that considering lifestyles will improve genetic prediction,” says Kaixiong Ye, PhD, corresponding author of the study and an assistant professor of genetics in UGA’s Franklin College of Arts and Sciences. “Our findings also support that fish oil supplements may counteract the genetic predisposition to high cholesterol.”

### Fish Oil Counters Effect of Family History of High Cholesterol

While a healthful diet and exercise can help prevent it, the CDC estimates that more than 86 million American adults—or about one in four—have high cholesterol.

Millions more are at risk of developing high cholesterol due to a variety of factors, including one they can’t control: genetics.

For people whose families have a history of high cholesterol, the study’s findings offer another possibility to help safeguard their health.

“Taking fish oil is associated with a shift toward a healthy lipid profile,” Ye explains.

The researchers also analyzed the effects of fish oil on HDL cholesterol and found that the supplements are beneficial in raising the so-called “good” cholesterol.

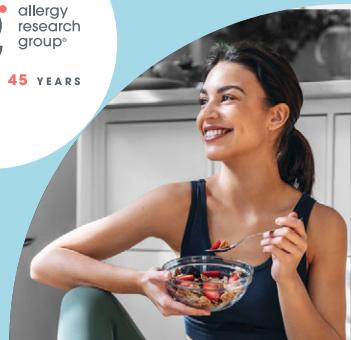
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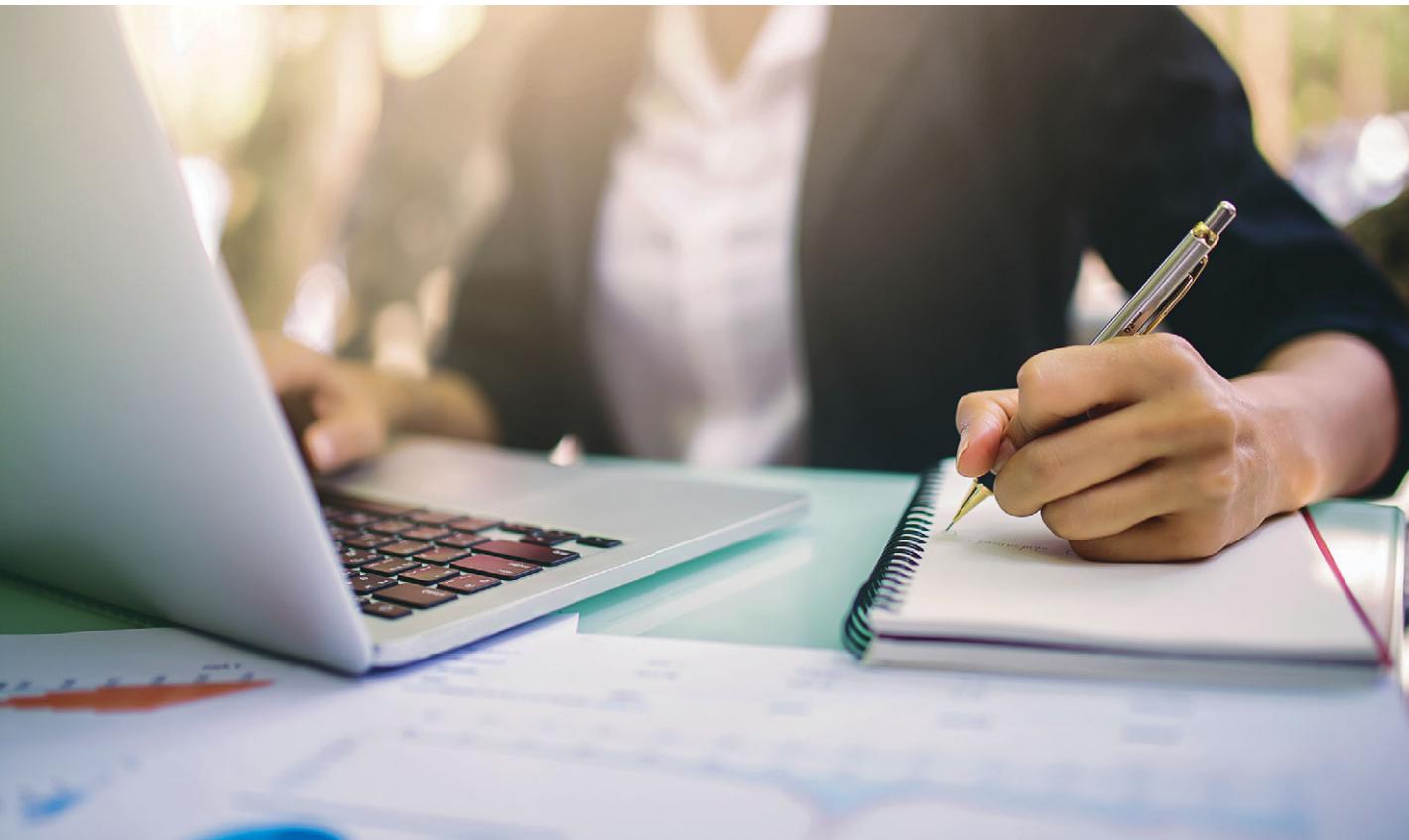
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# CDR Updates to CPEU Guidelines

Keep Up With the Latest Changes for Professional Development

**Q** I have heard that the Commission on Dietetic Registration (CDR) has updated its guidelines for becoming a provider for continuing professional education units (CPEUs); can you explain these changes?

**A:** RDs must obtain 75 CPEUs, while DTRs are required to obtain 50 CPEUs in a five-year cycle. The CDR updated the CPEU guidelines to support its ongoing efforts to enhance the quality of CPE for CDR-credentialed practitioners. The following article will explore what dietetic professionals and organizations should now know if they choose to be CPE providers.

## Importance of Staying Abreast

One important reason CDR updated the CPEU guidelines is “to address the trend of increased complaints regarding activities found to be in violation of CPE Accredited Provider Program Standards,” says Samantha Love, MS, RDN, director

of recertification and compliance at the CDR, credentialing agency for the Academy of Nutrition and Dietetics. According to the CDR, “Each CPE activity should be free from marketing and commercial bias, free from financial influence, and conducted in a way that promotes equity.”<sup>1</sup> In turn, these standards mean that a provider has been vetted by the CDR to deliver nutrition and dietetics-related CPE activities that meet specific standards for content, delivery, and assessment of learning outcomes. With many individual practitioners and organizations providing CPEUs in various ways (eg, webinars, lectures, conferences), it’s important to stay abreast of these changes in order to maintain compliance.

## Steps to Become a CPE Provider

In order to become a CPE provider, Love explains the updated steps that need to be taken with the following:

**1.** Potential providers must request a new CDR CPEU Prior Approval Account, which can take two to three business days to activate.<sup>2</sup>

**2.** Once the account is activated, the CPE Provider must complete all presubmission requirements before submitting CPE for Prior Approval of CPEUs.<sup>1</sup>

**3.** An Accountable Contact must be selected who is the liaison between the CPE Provider and CDR. The Accountable Contact represents the CPE Provider and is appointed by the CPE Provider to ensure compliance with Content Criteria, Activity Type Definitions, and CDR Provider Policies.<sup>3</sup> The Accountable Contact is responsible for ensuring compliance with content criteria, activity type definitions, and CDR CPE provider. Each Accountable Contact must complete Accountable Contact Training and attest to an understanding of policies. Each CPE Provider account may have up to three

active Accountable Contacts at a time. Each Accountable Contact must be designated as such in the CDR CPE Provider Portal.

**4. One Accountable Contact from each Provider account must complete and submit a Benchmarking Report. An initial Benchmarking Report must be submitted before a CPE Provider can submit CPE activities, thereafter, a Benchmarking Report must be submitted annually to the CDR.**

### Important Changes to the CPE Guidelines

Major changes that Love points out are that the CDR CPEU Accredited Provider Program has been phased out. Now, all new CPEU activities and those up for renewal must be submitted as single activity applications through the Prior Approval Process. Any Prior Approval Provider is now responsible for designating an Accountable Contact to serve as the available liaison to CDR staff. In addition, all CPE activities must comply with Policy 7.0 Marketing and Commercial Bias in CPE, which states that “All attempts to favor, recommend, purchase, use, or promote particular products, product groups, commodities, equipment, devices, services, branded treatment options, diagnostic screening tools, or tests are prohibited.”<sup>4</sup> Love explains that “The intention of this policy is that CPE be free of marketing and commercial bias; CPE is not a vehicle for marketing and may not be used to promote organizations, products, or services. Decisions related to CPE planning and presentation must not be made with or influenced by the objective to promote organizations, products, or services.”

### Trade and Brand Mentions in CPEU Activities

“Trade (eg, business or organization) or brand names may be included in CPE content for informational purposes only,” Love says. Trade or brand names may not be included in CPE content for promotional purposes. Informational content, which raises awareness through education, is based on the best available research evidence, which is supported by documentation from reputable, peer-reviewed scientific research.<sup>3</sup> An example Love provides is that a speaker may use the brand names of medications within a balanced, evidenced-based discussion on weight loss therapies. The speaker might say, “According to recent clinical trials, brand medication A demonstrates clinically significant weight loss, while brand medication B does not.” A speaker may not use the brand names of medications to encourage learners to purchase or recommend those medications.

### Can CPEU Be Sponsored?

Love explains that CPE Providers may use commercial support in order to do the following:

1. Fund honoraria or travel expenses of planners, reviewers, faculty, teachers, authors, and others involved in CPE content;
2. Pay for meals for all learners before or after CDR prior approved, nonenduring CPE activities; and
3. Defray or eliminate the cost of CPE for all learners. However, CPE providers may not use commercial support to pay for travel, lodging, honoraria, gifts, or other expenses for learners participating in CDR Prior Approved CPE; influence, control, contribute to, or impact CPE content.<sup>5</sup>

### Recommendations for Dietetic Professionals

If you or your company plans on being a CPE Provider, reviewing the 39-page CDR CPEU Provider Policy Manual is essential.<sup>5</sup> Additional resources such as case scenarios, glossary of terms, and FAQs are all available on the CDRs website.<sup>3,4,6</sup> Love adds that “Since December 2023, 1,300 individuals have completed CDR’s Accountable Contact Training. Since the program’s inception on April 1, 2024, 540 CPE Providers have submitted 2,340 CPE activities for Prior Approval.” She adds that “CDR would like to thank each of its CPE Providers for contributing to the many successes of the CDR CPEU Prior Approval Program ... and looks forward to continued partnership!” ■

Toby Amidor, MS, RD, CDN, FAND, is the founder of Toby Amidor Nutrition ([tobyamidornutrition.com](http://tobyamidornutrition.com)) and a *Wall Street Journal* bestselling author. She's written 11 cookbooks, including *Health Shots: 50 Simple Tonics to Help Improve Immunity, Ease Anxiety, Boost Energy, and More*. She's also an award-winning media dietitian, spokesperson, and nutrition expert for FoodNetwork.com and a contributor to *U.S. News* and other national outlets.



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# The Traditional Flavors of Mexico

Discover the Country's Staple Seasonings

**M**exican cuisine features flavors as bright and crisp as the sun-filled land from which it hails. With an estimated 37.2 million people of Mexican descent living in the United States as of 2021,<sup>1</sup> it's a culinary journey worth exploring for RDs and their patients and clients.

"Herbs, spices, and chiles are essential to Mexican cuisine," says Crystal Orozco, RDN, CDCES, CPT, a Latina RD and owner of Vida Nutrition Consulting. "Mexican cuisine is known for its bold and rich flavors, and each region in Mexico is rooted in history, tradition, and rich in culinary history."

"The unique thing about Mexican cuisine is that there's no one cuisine; instead, a myriad of tastes and cuisines make up Mexican cooking. Mexico has seven culinary regions, each with distinct food and drink styles," explains Marina Chaparro, MPH, RD, CDE, a Latina RD and owner of Nutrichicos.

Whether it's arrachera from the meat-forward Norteno region; cochinita pibil, a pork dish of Mayan origin from the Yucatan; or the street tacos famously hailing from Mexico City—herbs, spices, chiles, and other flavorings are the heart and soul of Mexico's vast culinary scene.

However, somewhere along the way, Mexican food in the United States picked up the reputation of being somewhat unhealthy. It is, in fact, nutritious, at least in part thanks to its diverse profile of seasonings and flavorings. For example, herbs and spices may help protect against disease due to their antioxidant, anti-inflammatory, and glucose-modulating properties.<sup>2</sup>

"Spices and herbs have been utilized for centuries, not only in cooking but also for their medicinal properties in various cultures. In some societies, spices have even served as a form of currency," Chaparro says. "Spices and herbs can help not just enhance flavor and improve texture in foods, but in terms of nutrition, they can help decrease the use of salt, sugar, and fat because they make food flavorful."

It would be an immense undertaking to create a list of all the seasonings and

flavors found in Mexico. This article will offer just a sample of some of the country's most used flavorings.

## Popular Mexican Herbs

- **Cilantro:** Brought to Mexico by the Spanish conquistadors, cilantro is one of the most widely used herbs in Mexican cuisine. Its bright, fresh flavor balances out the bold flavors of many dishes, including tacos, salsas, beans, and guacamole.

- **Epazote:** Epazote's distinct flavor is described as similar to a mix of oregano, anise, citrus, mint, and sometimes tar. Leaves are typically used fresh and may be added to soups, stews, and pots of beans. Some believe adding epazote to beans helps to reduce gas and bloating sometimes associated with eating beans.

- **Mexican Oregano:** Different than Mediterranean oregano, the Mexican variation has a stronger, more pungent flavor with citrus notes. It's often used in meat dishes such as carnitas as well as in mole and beans.

## Popular Mexican Spices

- **Achiote:** Achiote is a seed with a bright orange color and a strong, earthy flavor. It's often used in sauces and marinades and is a key ingredient in achiote paste, which is popular in the marinades of pibil-style dishes from Yucatan.

- **Anise:** With an herbal flavor similar to licorice, anise is found mostly in pastries or desserts in Mexican cuisine. Notably, it's used in Pan de Muerto, the traditional bread of the holiday Día de los Muertos.



- **Cinnamon:** Canela, the type of cinnamon found in Mexican cooking, has a milder, sweeter taste than the Cassia cinnamon typically found in the United States. It's used in desserts and pastries as well as mixed with other spices in savory sauces such as mole.

- **Cumin:** The warm, earthy flavor of cumin complements many Mexican dishes. Typically used in small amounts, whole cumin seeds are often ground with garlic and other spices to create unique seasoning blends.

## Popular Mexican Chiles

- **Jalapeño:** Jalapeños may be the most well-known chile outside of Mexico. They're milder than many other chiles with an almost sweet taste. Oftentimes, they're pickled in vinegar and enjoyed as a side or condiment. When they're dried and smoked, jalapeños are called chipotle peppers.

- **Serrano:** Smaller, thinner, and spicier than jalapeños, many Mexican cooks prefer these chiles for salsas and guacamole because of their sharp, clean flavor.

- **Ancho:** According to Mexican food expert Diana Kennedy, many chiles can be used dried or fresh, such as the ancho/poblano pepper.<sup>3</sup> Ancho chiles are the dried version of the poblano and are large, flattened peppers with lots of wrinkles. They're often paired

with other chiles and have a sweet, dried fruit flavor.

- **Chile de Árbol:** Chile de árbol may be used fresh or dried. It's a fairly spicy chile that pairs well with tomatoes and tomatillos, making it perfect for salsas or enchilada sauce. It can also be used to flavor chocolate or hot chocolate drinks.

- **Guajillo:** Guajillo chiles are one of the most commonly used peppers in the Mexican kitchen. They are found just about everywhere, including salsas, moles, and marinades. Their modest heat makes them perfect for pairing with other chiles.

## Popular Mexican Citrus

- **Lime:** Limes are a quintessential Mexican flavor. Used in everything from salsa, guacamole, ceviches, and aguachiles to tacos, beans, and enchiladas, a squeeze of lime adds brightness and freshness to Mexican food. They're also high in vitamin C, which helps with the absorption of plant-based iron found in beans.
- **Bitter or Seville Orange:** Brought to Mexico by the Spanish, bitter or Seville-style oranges have high acidity and work well in marinades for meat and seafood. The fruit has a rough, thick skin and ranges

from bright orange to green in color, depending on where they are grown. They're most popular in food from Yucatán and Veracruz. Mexican chef Pati Jinich offers the following substitute if you can't find bitter orange at the store: equal parts grapefruit, orange, lime juice, and white distilled vinegar.<sup>4</sup>

## Vanilla and Chocolate

Two iconic culinary flavors, vanilla and chocolate, are both native to Mexico. Culturally, their use dates back centuries. While they are commonly found in desserts and other sweet foods, they may also be used for savory dishes and sauces.

- **Vanilla:** The vanilla bean was first cultivated in Veracruz and is used in pan dulce, horchata, and flan to this day. The sweet, woodsy flavor of Mexican vanilla is distinct from other types of vanilla and may also contain notes of cinnamon, cocoa, raisin, and tamarind.
- **Chocolate:** Chocolate consumption dates back to the Aztec empire. Today, Mexican chocolate is made from cacao nibs, sugar, and cinnamon giving it a grainy texture due to the high sugar content. Other ingredients, such as chiles, vanilla, nutmeg, or almonds, may be added to create a more complex flavor.

## Getting in the Kitchen

It's easy to see the contribution seasonings and flavorings have on Mexican cuisine is vast and complex as well as how the cuisine is deeply rooted in history, tradition, and family.

"While I lived in Merida, Yucatán, I fell in love with Yucatecan cuisine, which is renowned for its unique flavors, especially for its underground cooking, also called pibil," Chaparro says. "One of my favorite recipes is cochinita pibil, which is pork marinated with a traditional recado rojo that utilizes so many spices like cumin, achiote, oregano, and cinnamon as well as sour orange to marinate the pork. Each family can create their distinct recado rojo, which gives the cochinita a unique flavor."

As dietitians, we can encourage our patients and clients, whether they have Mexican ancestry or not, to embrace this cultural cuisine both for flavor and for health.

"There are many quick & simple ways to start incorporating these ingredients at home," Orozco says. "Start with small amounts of ingredients like cilantro, lime, and mild chiles (such as poblano or Anaheim). Try adding cilantro to salads or tacos, or use cumin and oregano to season beans, soups, or grilled meats."

What's even better is that everyone in the family can enjoy flavors and seasonings from Mexico. Chaparro, who specializes in working with kids and families, says there's no need to wait to introduce flavors to the youngest eaters.

"As soon as babies start eating at 6 months, you can introduce herbs and seasonings," she says. "As long as the food is presented safely and appropriately, babies can enjoy spices like cinnamon, vanilla, garlic, cilantro, and so many others. Just be careful with the spice!"

Truthfully, the possibilities are endless when it comes to Mexican seasonings and flavorings. So, whether you choose to experiment with chiles or citrus, your culinary adventure is sure to be as bright, fresh, and vibrant as Mexico itself. ■

Dana Peters, MS, RD, is a registered dietitian and food and nutrition writer living in the Chicagoland area. She's passionate about making food simple, getting back to kitchen basics, and the power of eating together. Find out more at [danapetersrd.com](http://danapetersrd.com).

## Additional Resources to Explore

Don't stop here on the Mexican flavor journey. Dive even deeper into the nutrition and flavor profiles of the herbs and spices with the resources below.

### Books

- Jinich P, Mosier A. *Treasures of the Mexican Table: Classic Recipes, Local Secrets*. Houghton Mifflin Harcourt; 2021.
- Presilla ME. *Peppers of the Americas*. Lorena Jones Books; 2017.
- Cámera G, Watrous M, Nilsson M. *My Mexico City Kitchen: Recipes and Convictions*. Lorena Jones Books, an imprint of Ten Speed Press; 2019.

### Websites

- The Ultimate Guide to Mexican Spices: <https://spicesinc.com/blogs/ultimate-guide-mexican-spices>
- Your Latina Nutritionist: <https://yourlatinanutritionist.com/blog/mexican-herbs>

- Pati Jinich, Mexican Chef: <https://patijinich.com>
- Where Does Vanilla Come From?: <https://nielsenmassey.com/where-does-vanilla-come-from/>
- Cilantro/Coriander, Coriandrum sativum: <https://hort.extension.wisc.edu/articles/cilantro-coriander-coriandrum-sativum>
- What Is Epazote & How Do You Use It?: [www.thekitchn.com/ingredient-spotlight-epazote-152167](https://www.thekitchn.com/ingredient-spotlight-epazote-152167)
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# Switching to Sustainable Packaging

Eco-Friendly Policy Choices in Food Service

There's a growing movement in settings like schools, universities, hospitals, and large workplaces to adopt sustainable dishes and utensils in their food service settings. A range of high-profile institutions—from Princeton University<sup>1</sup> to the New York City public school system,<sup>2</sup> to major medical centers<sup>3,4</sup>—have all recently rolled out new sustainable containers in their cafeterias. If your food service environment wants to go sustainable as well, here's a guide to the pros and cons of various options, plus practical tips on making a switch.

## Why Sustainable Packaging?

Close to 1 trillion disposable food service products are used each year in the United States,<sup>5</sup> and this waste has serious environmental impacts. Single-use disposable products produce large amounts of greenhouse gasses through their life cycle, and they require large quantities of water to manufacture.<sup>6</sup> Once thrown out, disposable food service products clutter landfills and pollute Earth's oceans.

There are also health concerns associated with throw-away food packaging. Disposable food containers made with

plastic release microplastics into food and beverages,<sup>7</sup> and they also frequently contain health-harming chemicals that are known to leach into food and beverages.<sup>8-11</sup> “The food is becoming a vehicle to transfer these chemicals into our bodies,” says Jackie Nuñez, founder of The Last Plastic Straw advocacy and engagement manager at The Plastic Coalition, an advocacy nonprofit working to end plastic pollution.

## Compostable vs Reusable

For cafeterias looking to increase sustainability in food service ware, there are two basic options: compostable and reusable.

Compostable food packaging can be broken into two separate categories:

- Fiber packaging made from tree or plant fibers (like bamboo or sugarcane) is often used for paper plates and take-out containers when fiber packaging needs to resist grease or moisture; it's typically lined with bioplastic.<sup>12</sup>
- Compostable plastic packaging is made using the same processes as traditional plastics, but it's biodegradable in a composting facility. Some compostable plastics are made from plant materials, but others are made from fossil fuels.<sup>13</sup>

Not only does compostable packaging offer an alternative to throwing packaging waste into landfills but it also reduces food waste—a major selling point, given that food waste is a huge source of greenhouse gas emissions.<sup>14</sup> Instead of food waste on dishes going into the garbage, consumers can throw food packaging with its food waste into the compost bin. After the packaging breaks down, the resulting product (compost) absorbs and stores carbon, which reduces the concentration of carbon dioxide in the atmosphere.<sup>12</sup>

However, despite these benefits, compostable containers have serious drawbacks:

- **Cost:** Compostable packaging is often significantly more expensive than non-compostable disposable packaging.<sup>13</sup>
- **Health concerns:** Compostable food packaging—especially items that are designed to resist grease or moisture—often contains the same kinds of harmful chemicals found in single-use plastics.<sup>13</sup> These chemicals leach into food and beverages just like with traditional disposable food service ware.
- **Lack of composting facilities:** Compostable materials must be processed in an industrial composting facility, not disposed of in a landfill, or sent to a recycling facility.<sup>15</sup> However, many areas of the United States don't have access to such facilities.<sup>16</sup>
- **Packaging not desirable in compost:** Even where industrial composting facilities exist, many won't accept compostable packaging.<sup>15,16</sup> This is partly because compostable packaging doesn't always break down well and partly because compostable packaging tends to get mixed up with noncompostable packaging, contaminating the compost. In addition, packaging reduces the nutrient value of the compost.<sup>17</sup> “The main goal of creating compost is to create that nutrient-rich soil that goes back to agriculture,” says Madhavi Trikha, data science specialist at Upstream Policy Institute, a nonprofit working to promote the reuse movement in the US and Canada. “That inherently requires nutrient-dense rich soil. Bioplastics and paper don't add to that. They just add volume.”
- **Questionable environmental benefit:** An analysis by the state of Oregon found that many compostable food service items actually had *higher* environmental

impacts than noncompostables.<sup>17</sup> This is because most compostable food service ware is manufactured from agricultural products (sugarcane, corn, etc) that rely heavily on fossil fuels for the pesticides, fertilizers, and farming equipment used to grow those crops. Composting doesn't offset the impacts of the fossil fuels required for the initial manufacture of the packaging.<sup>5</sup>

Compostable materials could improve sustainability, depending on the circumstances; however, many environmental advocates argue for reusable materials instead. The following are a few reasons why:

**1. Reusables are cost-effective.** The initial investment is higher, but reusables save money over time. The University of Southern California (USC) in Los Angeles adopted compostable food service ware in its campus dining environments in 2022 before switching to reusable containers in October 2023. "By switching to the reusable option at [our] three dining halls, we saw an average cost reduction of 30% per year," says Lindsey Pine, MS, RDN, a dietitian for USC Hospitality. Many organizations worry about labor costs associated with washing reusables, but in practice, most organizations that have transitioned find they begin saving money within a few months.<sup>18-22</sup>

**2. Reusables are better for the environment.**<sup>23</sup> Reusables have to be reused enough times to reach a "break-even

point" where their environmental impacts are lower than disposable alternatives, but most reusable food service ware lasts well beyond this break-even point. After this point, reusables consistently win over disposables on almost every environmental measure, including energy consumption, water consumption, global warming potential, and effects on biodiversity.<sup>5,6</sup> This is generally true regardless of what material is used for the reusable product (glass, stainless steel, etc) and regardless of what material is used for the disposable product (paper with a polyethylene liner, laminated cardboard, etc).<sup>5</sup>

**3. Reusables are better for human health—at least if they're made of a material besides plastic.** Ceramic, glass, and stainless steel don't shed microplastics or leach health-harming chemicals.

In conclusion, compostable materials could be more sustainable than traditional disposables in certain cases; however, reusable containers are usually the better bet.

### Making a Switch: Practical Tips

If your organization is considering compostable containers, consider the following:

- **Find out whether there's an industrial composting facility nearby.** If there isn't—or if it doesn't accept packaging—there's no environmental value in adopting compostable materials.
- **Craft good signage.** "What often happens is that people will put compostable single-use plastic in recycling bins, but it's not actually recyclable. So it contaminates the recycling," says Shelie Miller, ME, PhD, a professor of sustainable systems at the University of Michigan in Ann Arbor, Michigan. "If you have a compost bin, a recycling bin, and a landfill bin, have [very clear] signage showing which items go where."
- **Consider why you're avoiding reusables.** The idea of switching to reusables might seem overwhelming, but recall that reusing used to be normal. "Pre-1940s, we did it," Nuñez says. "We did it before; we can do it again, and it's not like we will be going back to the dark ages. We have technology and systems that can streamline the process." Trikha concurs, urging, "For dietitians who are looking to choose between two

single-use materials, really look into reuse and don't just rule it out."

If your organization is considering reusables:

- **Consider dishwashing.** If your facility doesn't have dishwashing infrastructure, adding it is an up-front cost, but according to Trikha, most organizations make up that cost quickly. As an alternative, partner with a reuse service provider (RSP) to handle dishwashing. Pine and her team at USC contracted with USEFULL, an RSP that partners with a number of colleges and universities, but a range of other RSPs, such as Re:Dish and Topanga.io offer similar services.
- **Plan for how to collect containers.** In cafeterias where reusable dishware never leaves the building, implementing reuse is comparatively easy. However, in settings where consumers carry their food out and then have to bring the containers back, as in many university dining settings, it's trickier.

One key to getting high return rates, according to Miller, is to make return locations convenient. Also, consider a deposit-return scheme, where consumers pay a deposit for their containers and get the deposit back when they return them. "Whenever there is a monetary incentive or penalty, that makes return rates higher," Miller explains.

Contracting with an RSP can also help. RSPs manage dishwashing but also other logistics associated with collecting and tracking reusable dishware. "Do your research and see which company can best accommodate your business model," Pine says.

Finally, for dietitians seeking to incorporate more sustainability in their food service settings, remember to consider not just the food packaging but the food that's going inside as well. "No matter what your packaging system, the food inside those packages is going to matter way more," Miller says. "Food choices and food waste have the greatest environmental impact." ■

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For references, view this article on our website at [www.TodaysDietitian.com](http://www.TodaysDietitian.com).

## Additional Resources

- The Center for Environmental Health has a practical 12-step guide for how to transition a cafeteria away to reusable food service ware available at <https://ceh.org/ditching-disposables-toolkit/planning-guide-how-to-transform-your-cafeteria-ditching-disposables-toolkit/>. Although the guide is geared toward K-12 schools, much of the advice is relevant to other kinds of organizations as well.
- The nonprofit organization Upstream has a wealth of information on ditching disposables and shifting toward reuse in onsite dining: <https://upstreamsolutions.org/reuse-onsite>.

# The Updated DICAS Application Process

Discover the Details for Applicants and Program Directors

The matching system, where future interns applied to several programs and both parties ranked their top choices, is a thing of the past. With the number of dietetic internship (DI) programs growing while the number of students declines, and with many applicants and programs expressing concern that the former process was confusing, the Accreditation Council for Education in Nutrition and Dietetics (ACEND) Task Force implemented an updated version of the dietary internship application process called Dietary Inclusive Centralized Application Service (DICAS). The updated DICAS program will begin its pilot year in the 2024 to 2025 cycle. The process was updated to ensure an equitable process among all supervised practice programs. ACEND is the accrediting agency for education programs preparing students for careers as RDs and DTRs (dietetic technician, registered). This article will explore how the application process is now structured and what applicants and program directors who wish to supervise practice programs need to know.

## Programs Available

Understanding how programs are created will help applicants understand where they would like to apply. A Didactic Program in Dietetics (DPD) is an academic program designed to meet the knowledge requirements for dietetics practice. It's taught at a college or university recognized by the US Department of Education and requires completion of a degree, and can be designed at the baccalaureate or advanced degree level. Courses for the DPD must be part of the university requirements for whichever degree will be granted. Completion of a DPD enables the individual to apply to a supervised practice program, leading to eligibility for the registration examination for dietitians.

The DI is a postbaccalaureate program that provides only the required competencies (supervised practice) and admits students who have already completed an

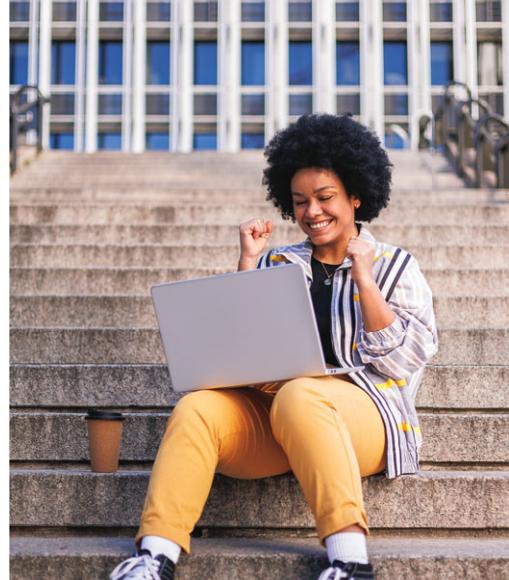
ACEND-accredited DPD and at least a baccalaureate degree. On the other hand, a coordinated program (CP) includes both academic courses similar to a DPD and supervised practice in one degree-granting program. There is also a graduate program (GP), which is designed to meet the required competencies (through academic coursework and supervised practice) for one degree-granting program. DPD graduates must complete a DI, CP, or GP to sit for the RD exam.

## The Updated Application Process

Any new change in process can make anyone question if the system overhaul is easier or better. Gena Seraita, MS, RD, CDN, program director for the New York University Dietetic Internship, believes this system will be more applicant-forward than the previous match system. "Now, in planning for it and experiencing it once, I strongly believe this will be a better system for applicants and program directors," Seraita says, as it provides applicants time to make an informed, thoughtful decision, rather than forcing a quick decision within 24 hours of receiving an appointment, as the old system required. "I am hopeful the new system will lead to more candidates accepting appointments at the best program for them and thriving."

For an applicant to use the system, they must start by creating an application profile in DICAS, which is a service of the Academy of Nutrition and Dietetics (the Academy).<sup>1</sup> DICAS is the centralized application service for dietetics that allows applicants to apply to multiple programs by completing a single online application.

Individual programs now set up application due dates and must notify applicants of their status by a standardized date, but can notify earlier. However, programs can't require accepted applicants to decide on enrollment until a standardized date. Applicants can be waitlisted if a spot in the program isn't filled. For



example, for spring 2025, on March 1, the applicant is notified of their status; decisions aren't required before March 15; and programs shouldn't accept applications after July 15. Applicants should check with each individual institution on exact dates, as they can vary.

As part of the new process, ACEND allows institutions who have multiple types of programs to have an "Institutional Exception" from the standardized process. This specific program may then set separate deadlines for their programs outside of the standardized dates. This may allow for "early decision" options for applicants interested in continuing their education and training at the same institution.

For the application in DICAS, only one set of transcripts and references need to be submitted. DICAS charges a fee for submitting the application within the system. In addition, programs may have their own application fees.

## Applicant Code of Conduct and Traffic Rules

All applicants to the RD and DTR programs are expected to follow the Academy's Code of Ethics.<sup>2</sup> In addition, ACEND developed the Applicant Code of Conduct and Traffic Rules.<sup>3</sup> Applicants are bound to legal and ethical standards of behavior during the admission process. Following the applicant code of conduct and traffic rules is important as "Program directors tend to value behaviors in candidates that are an indication of how the applicant will be if accepted to the program, so starting off by applying in the most ethical way is important," Seraita explains. In addition, Seraita says that the field of nutrition and dietetics is small, and making a good

impression is important, even early on in a student's career. Plus, it is also important to consider the impact that not following the code of conduct and traffic rules can have on peers.

### Recommendation for Applicants

Seraita's recommendations for applicants when using the updated DICAS system include the following:

- Be thoughtful when choosing programs to apply to. Make sure you research the program, what it requires for you to complete, and how it will help you achieve your career goals. Low engagement because you didn't take the time to ensure the program offered what you were seeking can impact your success in the program, so taking the time to research before applying is key to making a very important decision.
- Ensure you visit the ACEND website to review the process and key deadlines for applying to programs and using DICAS. The DICAS system also has many excellent training resources that can be helpful.
- Ensure you're tracking the deadlines for all programs you're applying to. Though notification dates are somewhat standardized in the new process, due dates are unique and set by each program. Create a list for yourself to ensure you stay on top of these dates.
- Make sure you're reviewing and double-checking to ensure you're submitting your application to the right program. Some programs have similar names, and applicants have submitted to the wrong program in the past. An extra scan can help avoid this kind of error.
- ACEND has strict standards of information that must be available on a program's website. As such, read the ACEND website thoroughly before reaching out with questions you can find the answers to on your own.
- If you're a "career changer," celebrate it on your application. Did you have to juggle a job and school? Did that impact your grades? Share about that on your application and in your personal statements. These types of items on your application can help program directors identify qualities of work ethic, flexibility, and grit in your application that are highly valued.

For further assistance with the centralized application, contact DICAS customer support at 617-612-2855.

### Application Process for Program Directors

The process was updated to ensure an equitable process among all supervised practice programs and the guidelines for nutrition and dietetics supervised practice programs and their institutions agreed to conduct their annual admission process. Programs can use the software portal to access supervised practice programs such as CP, GP (also referred to as future education model), and DI. Program directors must learn about the updated DICAS and the application review software, WebAdMIT. The Academy provides webinars, training courses, and readings to help train program directors who must configure programs in DICAS and learn WebAdMIT.<sup>4</sup>

WebAdMit has a prelaunch portal, separate from the live version of WebAdMIT where program directors can create and edit programs before they're pushed into the live versions of the application and available for applicants to apply to the program.<sup>5</sup> Once the application is live, program directors can log in to WebAdMIT Production to work with current applications, set up review processes, and export data.

There's no longer a standardized date for application submission due dates, and programs can now set the date that works best for their respective program. Program directors are asked to consider a standardized notification date to allow enough time to review applications and select candidates for the program. A two-week timeframe between the latest date to notify applicants and the earliest date when programs can require applicants to make a decision is recommended.

### Program Code of Conduct and Traffic Rules

Nutrition and dietetics programs must adhere to the Code of Ethics for the Nutrition and Dietetics Profession and must follow core values during the admission process, including customer focus, integrity, innovation, social responsibility, and diversity. Nutrition and dietetics programs make pledges, including the following:

- Act with honesty and integrity throughout the admission process when interacting with nutrition and dietetics applicants, other program directors, faculty, staff, and DICAS staff.
- Abide by the admission rules for programs.
- ACEND encourages each of its member programs and institutions to conduct an application process that is inclusive and professional.

### Recommendation for Program Directors

With experience using the DICAS system, Seraita recommends program directors consider the following:

- Take advantage of the ability to personalize their home page, which is a new feature. The home page now can have a description and more information.
- The new system can help personalize the application process and specific screening questions can be added to help choose the right applicants for the program.
- After setting up the school's application, each program a school has an application form will have a specific URL (another new feature). This specific program application URL can be posted on the school's website to allow applicants to easily access the program application they want.
- Check the ACEND website for possible updates about the application cycle and other important happenings in the Academy.

If you need assistance with DICAS WebAdMIT (program side), please contact DICAS customer support or call 857-304-2020. ■

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For references, view this article on our website at [www.TodaysDietitian.com](http://www.TodaysDietitian.com).

# An Update on Nonnutritive Sweeteners

## *Benefits, Risks, and Recommendations*

By Alexandria Hardy, RDN, LDN

A

rtificial sweeteners, also called alternative, nonnutritive, and low- or no-calorie sweeteners, are a popular ingredient in many foods and beverages.<sup>1</sup> Consumption of artificial sweeteners remains steady over the past two years, with the most popular including stevia-based sweeteners, monk fruit sweeteners, and aspartame.<sup>2</sup> This article will focus on their role in foods and beverages and specifically how research and recommendations have evolved in recent years.<sup>3</sup>

### **Who Uses Artificial Sweeteners?**

According to a consumer survey, Public Perceptions of Dietary Sweeteners published in 2023 by the International Food Information Council, 28% of Americans report regularly and intentionally using low- or no-calorie sweeteners.<sup>2</sup> Over 50% of people believe that eating and drinking products with no- or low-calorie sweeteners may improve their health.<sup>2</sup>

### **Overview of Common Alternative/Artificial Sweeteners**

Artificial sweeteners create a sweet taste by stimulating sweet-taste receptors in the mouth, which then send signals to the brain. Recent research shows that these sweet-taste receptors are also located in other parts of the body like the gastrointestinal tract, pancreas, brain, and fat tissue.<sup>4</sup> This discovery suggests that nonnutritive sweeteners (NNSs) may have broader effects on metabolism, as seen in various lab, animal, and human studies.<sup>4</sup>

### **Sucralose**

Sucralose, more commonly known as Splenda, is a NNS that is 600 times sweeter than sugar.<sup>5</sup> It's often used in beverages, cooking, and baking and is made from sugar through a process that replaces three hydroxyl groups on the sugar molecule with chlorine atoms. Sucralose is minimally absorbed by the body and is primarily excreted unchanged in the urine, which contributes to its zero-calorie nature.<sup>5</sup>

Recent concerns have arisen regarding sucralose intake and cancer risk, specifically in regard to sucralose's chemical instability.<sup>5</sup> It can release chlorinated aromatic polycyclic hydrocarbons, which are toxic compounds that may be carcinogenic in large quantities in the body.<sup>5</sup> These studies have primarily been carried out via mouse models and more well designed research is needed in large, stratified human populations to better understand the risk of sucralose consumption and cancer. Additional research from *Advances in Nutrition* indicates sucralose may negatively impact insulin sensitivity and glucose metabolism, particularly in



individuals with increased gastrointestinal permeability, such as those with obesity or diabetes.<sup>6</sup> While earlier studies indicated no impact, methodological limitations highlight the need for more robust, long-term trials using precise techniques to clarify sucralose's effects on glucose homeostasis. There is also more research that needs to be conducted regarding sucralose metabolism and absorption in specific populations, like children and pregnant and lactating women, as sucralose can cross the placenta.<sup>7</sup>

### Aspartame and Acesulfame-K

Nearly 200 times sweeter than sugar, aspartame is also known as Nutrasweet, Equal, and Sugar Twin.<sup>8</sup> Chemically, aspartame is a dipeptide containing aspartic acid and phenylalanine, which when combined yield a sweet flavor. Aspartame is typically used in beverages, gum, syrup, and tabletop sweeteners. Acesulfame-K is a similar sweetener that is often consumed in similar ways and studied alongside aspartame.

A systematic review and meta-analysis in *Advances in Nutrition* examined the effects of both NNSs on appetite and satiety and determined that they significantly reduced energy intake compared with sugar and water but did not reliably affect blood glucose, subjective appetite scores, or incretin hormone levels.<sup>9</sup> Additional high-quality studies are needed to clarify their metabolic effects at dietarily relevant levels.

There have long been questions of whether aspartame intake is linked to neurological disease and cancer. Per the National Cancer Institute, there is no clear association between aspartame consumption and increased risk for cancer.<sup>10</sup> The FDA and the Joint Food and Agricultural Organization (JECFA)/World Health Organization Expert Committee on Food Additives consider aspartame safe when consumed within approved levels, and JECFA has not changed the acceptable daily intake. Aspartame is one of the most widely studied food additives, and many regulatory authorities worldwide, including Health Canada and the European Food Safety Authority, also deem it safe.<sup>8</sup>

### Sugar Alcohols

The most consumed sugar alcohols include erythritol, xylitol, and sorbitol. They are also known as "modified sugars" and are less sweet than sucralose and aspartame.<sup>11</sup> They are frequently found in sugar-free candies, chewing gum, and desserts and can be mixed with other

types of artificial sweeteners to make them more palatable.<sup>11</sup> When consumed in large quantities or by those who may be more sensitive to their effects, they can cause gastrointestinal distress, including bloating, gas, and diarrhea, because they are poorly absorbed.<sup>12</sup> Erythritol is generally better tolerated as it is more readily absorbed with fewer gastrointestinal side effects than xylitol and sorbitol.<sup>12</sup>

### Stevia

Steviol glycosides are a type of sweet compound that comes from the leaves of a South American plant called *Stevia rebaudiana Bertoni*.<sup>13</sup> The most well-known commercial sweeteners are stevioside and rebaudioside A (Reb A), which is also known as stevia.<sup>13</sup> They are chemically and structurally different, with Reb A (stevia) used more commonly in foods and beverages as it tends to have a less bitter flavor and no licorice aftertaste, which can be tasted after consuming stevioside.<sup>14</sup> Stevia is commonly used in desserts, baked goods, dairy products, drinks, and condiments.<sup>13</sup> Conversion of stevioside and rebaudioside A into steviol occurs in the liver, which is then excreted through urine.<sup>15</sup> Oral consumption of stevioside at the recommended dose of 4 mg/kg is safe, nonteratogenic, and noncarcinogenic.<sup>15</sup> More human studies are needed to determine why stevia and stevioside may have different pharmacological effects.<sup>15</sup>

### Monk Fruit

Monk fruit, locally known as luo han guo or lo han kuo, is a popular zero-calorie natural sweetener that is 100 to 300 times as sweet as sugar.<sup>16,17</sup> The fruit has been used in traditional Chinese medicine for centuries but was only approved as a sweetener in the United States by the FDA in 2010. It can be mixed with other sweeteners like erythritol or sucralose and is often found in a granular or liquid form for baking and cooking. It is generally recognized as safe (GRAS) and its sweetness is attributed to a group of natural compounds known as mogrosides, with mogroside V being most abundant. Monk fruit does not contain carbohydrates and thus has been recommended for use in those with diabetes.<sup>18</sup>

### Allulose

Allulose, also known as D-allulose, is a rare, naturally occurring sugar found in small amounts in plant foods, but it is also commercially produced from corn or fructose. It contains only 10% of the calories of table sugar and is minimally absorbed. When combined with erythritol, it has the potential to exert a positive effect on the hunger hormone ghrelin and improve glycemic control.<sup>19</sup> The FDA has approved allulose as safe for consumption, and while it is not yet widely used, it has potential as a low-calorie sweetener in food and beverages.

### FDA Classification and Safety of NNS

There are several different metrics used to help determine the safety of NNSs. One is establishing the Acceptable Daily Intake or ADI. These limits represent the number of packets considered safe to consume daily without causing harm.<sup>8</sup> For example, the ADI for aspartame (Equal) is 75 packets, while the ADI for sucralose (Splenda) is 23 and the ADI for saccharin (Sweet N'Low) is 45.<sup>8</sup> Rebaudioside A based sweeteners like Truvia and PureVia clock in at 27.<sup>8</sup> Dietitians can help translate this information for their clients by explaining that each packet contains 2 tsp or 8 g of sweetener, and helping them identify and sum up different sources of NNSs in their diet.

Another common methodology for establishing safety for NNSs is to assign them a GRAS status. GRAS refers to substances that are added to food that are considered safe by qualified experts and do not require premarket approval by the FDA unless they are classified as food additives.<sup>20</sup> GRAS sweeteners in the United States include saccharin, aspartame, sucralose, neotame, acesulfame-K, allulose, and stevia; sugar alcohols are also recognized as safe.<sup>8,21</sup>



## Latest Research on Health Impacts of Alternative Sweeteners

Research on NNSs is ever evolving as more products hit the market and are consumed in different quantities in different populations. Below are recent research highlights from five specific health indicators.

### Gut Microbiome

The effects of NNSs on gut microbiota are still being explored, with studies showing mixed results. NNSs can alter gut microbial composition and metabolic activity, potentially reducing beneficial bacteria while increasing pathogenic strains, which may lead to inflammation, gut dysbiosis, and changes in glucose metabolism.<sup>22</sup> These effects, including shifts in short-chain fatty acid production, bile acid levels, and gut hormone release, highlight their potential role in metabolic and inflammatory diseases.<sup>22</sup> While regulatory bodies like the FDA and the European Food Safety Authority broadly deem NNSs safe within ADI limits, different NNSs may each react differently in the gut.<sup>4,23</sup> For example, sucralose can potentially alter gut microbiota composition but aspartame does not, and sugar alcohols may promote beneficial bacteria and bolster production of short-chain fatty acids.<sup>4,24</sup>

Further research is needed to better understand how and why different types and doses of NNSs affect the gut and hunger hormone signaling and how long their impact lasts.<sup>4,24</sup> It's important to note that not all NNS research can be broadly applied, owed to the different chemical compositions of each type. A summary of preclinical and clinical data published in *Nutrients* further supports this idea, citing conflicting results of NNS impact on the type and number of bacteria present in the microbiome due to factors like diet, lifestyle, and our natural and built environments.<sup>22</sup>

### Metabolic Health

A review published in *Cureus* evaluated the impact of NNSs on human health to determine risks and benefits of consumption. The review found that there was a significant association between NNS intake and blood sugar (increased fasting levels and A1c as well as impaired glucose tolerance), weight gain in the midsection, and higher alanine aminotransferase levels, which can signal liver impairment.<sup>25-27</sup> There was also a positive correlation between intake and delayed stomach emptying and intestinal transit; this may lead to increased gastrointestinal distress.<sup>25</sup>

### CVD

The relationship between NNSs and CVD risk is unclear, with some studies showing direct associations with adverse outcomes while others find no harm. Data from the NutriNet-Santé cohort suggest that NNS intake, including aspartame, acesulfame-K, and sucralose, is linked to increased risks of cerebrovascular events and coronary heart disease.<sup>28</sup> These findings indicate that replacing added sugars with some NNS may not provide cardiovascular benefits.<sup>25,29</sup> Emerging evidence from *Advances in Nutrition* suggests sucralose may interact with bitter receptors called TAS2Rs in the cardiovascular system, potentially influencing blood pressure and vascular health through inotropic and vasodilator effects. However, further clinical studies are needed to clarify its long-term impact on cardiometabolic health.<sup>6</sup>

### Neurological Impacts

Aspartame is the primary NNS that has been linked to neurological symptoms such as headaches, migraines, seizures, anxiety, depression, and insomnia.<sup>25</sup> Its components, phenylalanine and aspartate, can increase brain levels of certain compounds that disrupt neurochemical balance, affecting dopamine, norepinephrine, and serotonin regulation.<sup>25</sup> Additionally, aspartame may act as a chemical stressor by raising cortisol levels and oxidative stress, potentially worsening neurobehavioral health and contributing to migraine pathophysiology through serotonin-related vascular changes.<sup>25</sup> There is also mixed research that indicates that long-term consumption of NNS can change the way the brain responds to sweet tastes and how it differentiates and responds to nutritive and NNS.<sup>30</sup> More research is needed to confirm these findings and determine the long-term effects of NNS on sweet taste perception.<sup>30</sup>

### Cancer

Research on NNSs and cancer risk shows mixed findings.<sup>25,29</sup> While early animal studies suggest a potential carcinogenic effect of aspartame (particularly with prenatal exposure) these results have not been consistently replicated in human studies. Systematic reviews and meta-analyses of human data show no significant association between NNSs and cancer risk, with some even suggesting a reduced risk of urinary system cancers in women.<sup>25</sup> However, a large scale population-based study published in *PLoS Med* found an increased overall cancer risk in individuals who

regularly consumed high quantities of aspartame and acesulfame-K; aspartame was also associated with a higher risk of breast and obesity-related cancers.<sup>28</sup>

## Evidence-Based Recommendations for Dietitians

The World Health Organization recommends that added sugar should comprise no more than 5% of total energy intake, which is significantly lower than the average American intake of about 13%.<sup>3</sup> Dietitians can guide clients in choosing sweeteners based on their unique metabolic profiles and needs, as research on the impact of low- or no-calorie sweeteners on health remains inconclusive.

While individual sweeteners may appeal to different clients based on personal preferences, an important piece of advice for dietitians is to encourage balanced dietary patterns, including a variety of nutrient-dense whole foods providing sufficient macro and micronutrients. This approach is likely to ensure high dietary quality and minimize the impact of occasional sweetener use.

For clients who rely heavily on products featuring NNSs, offering specific swaps with a similar textural or flavor profile may be helpful. For example, encouraging a fruit and mint infused sparkling water as a substitute for a drink sweetened with an NNS may still provide the fizz and light sweetness they crave. As always, RDs should take each client's goals and health into consideration as they provide individualized education and recommendations, most effectively made by staying abreast of new research surrounding NNSs.

## Conclusion

Enjoying something sweet is a natural and joyful part of eating, and dietitians are positioned to help their clients navigate research and guidelines to make the best choices for their specific nutrition goals.

Though research is inconclusive and ongoing, most studies indicate that there just isn't enough high quality, evidence-based research available to support higher intakes of NNS in the diet. ■

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For references, view this article on our website at [www.TodaysDietitian.com](http://www.TodaysDietitian.com).

# L-carnitine & CVD

By Carrie Dennett, MPH, RDN, CD

**D**espite being a conditionally essential nutrient, carnitine is a topic of uncertainty, even controversy, because it's like a coin with two sides, and those sides can appear to be in direct conflict with each other. On one side, evidence from randomized controlled trials suggests that circulating levels of carnitine may increase the risk of atherosclerosis and CVD. On the other side, evidence from randomized controlled trials also suggests that L-carnitine may be a beneficial adjunct to standard medical treatment for CVD. Both narratives are complicated and nuanced.

Carnitine is a generic term for several compounds, including L-carnitine, acetyl-L-carnitine, and propionyl-L-carnitine. Humans can synthesize carnitine from the amino acids lysine and methionine, which is why it's a conditionally essential nutrient. This synthesis happens primarily in the liver, with some in the kidneys, before

being transported to other tissues. Carnitine is abundant in animal food sources, especially red meat. Carnitine is most concentrated in tissues that use fatty acids as their primary fuel, such as skeletal and cardiac muscle because it's required for mitochondrial beta-oxidation of long-chain fatty acids for energy production.<sup>1</sup>

## Carnitine Deficiency and Dietary Sources

The human body needs about 15 mg of carnitine per day from a combination of endogenous and dietary sources, and a typical omnivore diet provides up to 10 times that amount.<sup>2</sup> Healthy individuals generally synthesize enough carnitine to prevent deficiency. However, pregnancy and certain health conditions may cause increased excretion of carnitine, which could increase risk of deficiency.

Oral or intravenous L-carnitine supplementation is used for treatment of both primary and secondary carnitine deficiencies.<sup>1</sup> Primary systemic carnitine deficiency is a rare condition caused by mutations in the gene that codes for the carnitine transporter, OCTN2. This causes poor intestinal absorption of dietary carnitine, increased urinary loss of carnitine due to poor reabsorption, and defective carnitine uptake by muscles.<sup>3</sup> Secondary carnitine deficiencies are typically caused by inherited genetic defects in the metabolism of amino acids, cholesterol, and fatty acids and are also



## Teasing Out the Potential Benefits and Potential Harms



found in patients with end-stage renal disease undergoing hemodialysis, which impairs the reabsorption of carnitine.<sup>1</sup>

Looking at dietary sources, 3 oz of beef steak provides 42 to 122 mg of L-carnitine, 3 oz of cooked ground beef provides 64 to 74 mg, 1 cup of whole milk provides 8 mg, and 3 oz of cooked chicken breast provides 2 to 4 mg.<sup>1</sup> Many energy drinks also contain L-carnitine, according to a 2022 study, but the amounts were not available.<sup>4</sup> The bioavailability of dietary carnitine can vary depending on the amount in a meal and whether someone typically eats a plant-based diet or a diet that's higher in meat. Overall, bioavailability from food is 54% to 87%, significantly higher than the 14% to 18% bioavailability of L-carnitine in oral supplement form. Regardless of the source, unabsorbed L-carnitine is degraded by colonic bacteria,<sup>5</sup> which research suggests is a key step in the potential risks of elevated L-carnitine intake.

### L-carnitine, TMAO, and CVD

While research has found associations between increased circulating levels of L-carnitine and increased risk of atherosclerosis and CVD, the

real concern may be how carnitine is metabolized. The gut microbiota converts L-carnitine into trimethylamine (TMA), which may then be oxidized by enzymes in the liver to form trimethylamine N-oxide (TMAO). TMAO, which can also be formed from choline as a precursor, is itself associated with an increased risk of CVD despite being naturally found in some species of fish and seafood. While elevated plasma concentrations of L-carnitine are associated with increased risk of cardiovascular incidents—such as heart attack, stroke, and death—Independent of traditional CVD risk factors, this appears to only be true when TMAO is also elevated.<sup>6</sup> Proposed mechanisms include effects on cholesterol, the hormone angiotensin II—which can raise blood pressure, and increased platelet clumping, possibly leading to blood clots.<sup>7,8</sup>

A 2020 cross-sectional study using data from 1,653 participants in the Multiethnic Cohort Study identified several associations of plasma levels of TMAO and its precursors, including carnitine, with inflammatory and cardiometabolic biomarkers. Higher concentrations of carnitine were seen in the upper quartiles of

TMAO.<sup>9</sup> A 2017 systemic review and meta-analysis found that high TMAO levels were a much stronger predictor of cardiovascular events than were elevated levels of its nutrient precursors, including carnitine, regardless of conventional CVD risk factors.<sup>10</sup>

To investigate whether circulating L-carnitine is related to the risk of incident coronary heart disease (CHD) in apparently healthy people at normal risk, A 2022 prospective nested case-control study looked at associations between CVD risk and 10-year changes in plasma L-carnitine levels in 772 women enrolled in the Nurses' Health Study. Women who remained free from nonfatal myocardial infarction or fatal CHD at the 10-year mark were followed for about 16 more years, during which time researchers identified 386 incident cases of CHD and randomly selected one matched control for each.<sup>11</sup>

Overall, a greater increase in L-carnitine over the initial 10 years was related to a 36% higher risk of CHD in the subsequent follow-up, regardless of the initial L-carnitine levels. The 10-year changes in L-carnitine were positively associated with red meat consumption over time, and women

who had greater increases in L-carnitine and red meat intake of 36 g/day or more, had an 86% greater risk of CHD, as compared with those with lower red meat intake and lesser increases in L-carnitine. There was also a significant correlation between TMAO changes and L-carnitine changes in the women with CHD.

Kevin Klatt, PhD, RD, an assistant research scientist and instructor in the Department of Nutrition Sciences and Toxicology at University of California, Berkeley, cautions that epidemiological studies using circulating levels of nutrients or metabolites as proxies for dietary exposure often don't correlate with randomized controlled trials that aim to increase levels of those nutrients or metabolites. "This is often because circulating levels are subject to varying levels of homeostatic regulation, reflecting not only intake but also absorption, distribution across tissues, metabolism to other compounds, and excretion," he says."

Johanna Lampe, PhD, RD, research professor in the Department of Epidemiology at the University of Washington School

gamma-butyrobetaine (GBB), which has been shown to be atherogenic in mice, although research in humans is inconclusive.<sup>6</sup> Multiple microbes in both the small and large intestines can convert dietary L-carnitine into GBB, but relatively few can transform GBB into TMA.<sup>13</sup> The GBB-to-TMA conversion is much higher in omnivores than in vegans and vegetarians, likely because of differences in the gut microbiota, although this aspect of the L-carnitine-to-TMAO pathway is not fully understood. Interestingly, in a group of seven vegans/vegetarians given 500 mg/day of supplemental L-carnitine for two to three months, only three demonstrated increased GBB-to-TMA conversion.<sup>6</sup>

There could be a genetic explanation. Exposure to GBB results in the up-regulation of a specific microbial gene cluster, *gbu* (GBB utilizing), which is responsible for the conversion of GBB to TMA—and more abundant in people who eat red meat. In many vegans, expression of the necessary genes appears to either be absent or suppressed to nearly

events (death, myocardial infarction, or stroke), but only when TMAO levels were also elevated.<sup>14</sup>

Continuing along the carnitine metabolism pathway to the liver, individual genetic variation may play a role in elevated TMAO levels by increasing conversion of TMA to TMAO by the enzyme flavin-containing monooxygenase 3 (FMO3). Increased expression of the FMO3 gene could be a culprit in atherosclerosis and CVD.<sup>8</sup> FMO3 may have adverse effects on blood lipids and glucose independently of TMAO formation, although more research is needed.<sup>15</sup>

Also, in the liver, trimethyllysine (TML), a modified amino acid, can be converted to GBB and then to carnitine and potentially to TMA and TMAO. A 2016 study found that patients with carotid atherosclerosis had elevated blood levels of GBB and carnitine but not TML or TMAO, compared with healthy controls. However, higher serum levels of GBB and TML, but not TMAO or carnitine, were independently associated with cardiovascular death after adjustment for estimated glomerular filtration rate.<sup>16</sup>

### L-carnitine in CVD Treatment

Despite research on potential cardiovascular risks of elevated levels of carnitine or its metabolites, L-carnitine is emerging as a target for CVD prevention and treatment due to its important role in the oxidation of fatty acids and cardiac energy metabolism. L-carnitine facilitates transport of long-chain fatty acids into the mitochondrial matrix, where it can reduce oxidative stress and may reduce markers of inflammation.<sup>17-19</sup> During ischemic events that block blood flow to the heart, carnitine prevents the fatty acid ester accumulation that can lead to fatal ventricular arrhythmias.<sup>18</sup> However, results of clinical trials of the effects of carnitine supplements on CVD have been mixed.

A 2020 systemic review and meta-analysis of 44 randomized controlled trials that included both healthy adults and those with certain health conditions found that L-carnitine supplementation significantly lowered the inflammatory markers C-reactive protein, interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-alpha), and malondialdehyde; and significantly increased levels of the endogenous antioxidant superoxide dismutase. IL-6 and TNF-alpha levels showed a greater decrease with higher dosages of

## "Dietitians should be thinking about how to communicate what we know and don't know in populations pursuing carnitine supplementation."

of Public Health and associate director of the Public Health Services Division at Fred Hutchinson Cancer Research Center in Seattle, says about 95% of TMA is converted to TMAO in the liver. "From that standpoint, it's probably more the variation in what's happening at the microbiome level as far as exposure to these compounds."

That's why the TMAO synthesis pathway has become one of the first gut microbiota targets for pharmaceutical interventions to prevent CVD,<sup>12</sup> even though that pathway is quite complex.

### Genetic Influences and Complex Pathways

The gut microbiota's first step in converting unabsorbed carnitine into TMA is generation of the intermediate

undetectable levels. This elimination of the *gbu* gene cluster from the gut microbiome may be a mechanism that helps explain why plant-based diets are associated with reduced risk of CVD and other metabolic disorders associated with elevated TMAO.<sup>14</sup>

Researchers have questioned whether GBB levels themselves could play a role in CVD risk. In a clinical cohort of 2,918 participants, fasting levels of GBB were dose-dependently associated with prevalence of CVD, coronary artery disease (CAD), and peripheral artery disease (PAD), even after adjusting for traditional risk factors. Higher GBB levels were also associated with increased risk of—and poorer survival from—major cardiovascular

L-carnitine. Ten studies used a dosage of less than 500 mg, seven trials used 500 to 1,000 mg, 12 used 1,000 to 2,000 mg, and 13 used 2,000 or more mg.<sup>20</sup>

A 2019 systematic review and meta-analysis of 13 randomized clinical trials found that L-carnitine supplementation was significantly associated with lower levels of C-reactive protein in comparison to controls. Also, a slight but statistically significant decrease was observed in IL-6 and TNF-alpha levels. The results were stronger in studies longer than 12 weeks, and doses higher than 2,000mg/day more effectively reduced TNF-alpha.<sup>17</sup>

Results of a 2023 umbrella meta-analysis on 13 interventional meta-analyses suggest that supplemental doses of L-carnitine of more than 2 g/day can decrease total and LDL-cholesterol and triglycerides, and increase HDL-cholesterol levels. However, the authors noted that the results were heterogeneous, and except for LDL-cholesterol, the results, while statistically significant, were not clinically significant.<sup>21</sup> A 2016 study found that in patients with elevated LDL, triglyceride, and lipoprotein (a) levels who received 2 g of L-carnitine plus 20 mg/day of simvastatin had a statistically significant but modest reduction in lipoprotein (a) compared with patients who received the simvastatin plus placebo.<sup>22</sup>

A meta-analysis of 17 clinical trials that included 1,625 adults with chronic heart failure found that supplementing with 1 to 6 g/day of L-carnitine for seven days to three years improved clinical symptoms and cardiac function compared with conventional treatment, and the benefits did not vary by supplement dose or study duration.<sup>23</sup> A 2022 systemic review and dose-response meta-analysis of 22 randomized controlled human trials found that L-carnitine supplementation did not have a significant effect on blood pressure.<sup>24</sup>

A 2022 study that used Mendelian randomization found that genetically predicted higher endogenous L-carnitine levels were nominally associated with higher risk of CAD and heart failure in men and women, although the association did not hold for CAD in women from some data sources. Genetically predicted higher L-carnitine levels were also associated with higher triglyceride levels and lower HDL levels in men. The authors concluded that these results suggest no benefit of L-carnitine for CVD or its risk factors, with the caveat that the role of endogenous



L-carnitine may not correspond to exogenous carnitine from food or supplements.<sup>25</sup>

A 2022 randomized clinical trial gave 1 g supplemental L-carnitine or placebo twice a day for six months to 157 individuals aged 58 to 75 years with metabolic syndrome. Total and LDL cholesterol levels increased in the L-carnitine group, and L-carnitine supplementation was also associated with 9.3% greater carotid arterial plaque stenosis in males who ate less red meat and had lower baseline stenosis and total plaque volume than other participants.<sup>26</sup>

A 2018 study including participants on a nonvegetarian diet found that 24 weeks of supplementation with 1,500 mg of L-carnitine increased fasting blood levels of carnitine and increased levels of TMAO tenfold but did not increase lipids, inflammatory markers, or other markers of atherosclerosis in healthy, omnivore, non-smoking, physically active women ages 65 to 70 when compared with placebo. The authors noted that the length of the study was a limitation, as atherosclerosis develops over many years.<sup>27</sup>

### Recommendations for RDs

How should dietitians make sense of the unclear role of carnitine in CVD—and how should they advise patients and consumers?

"Carnitine is like many areas of nutrition where we lack large, well-conducted placebo-controlled randomized trials assessing disease endpoints. It is exceedingly easy to look at a compound like carnitine and come up with biologically plausible reasons it should be 'good' or 'bad' for cardiovascular diseases," he says. "The impact on TMAO levels and whether this causally increases CVD risk is still uncertain. Dietitians should be thinking about carnitine and how to communicate what we know and don't

know in populations where users may be pursuing carnitine supplementation."

Those populations include both recreational and elite athletes, who may use L-carnitine supplements for performance enhancement. A 2020 systematic review found that short-term use may have benefits, but long-term use can elevate fasting TMAO.<sup>28</sup>

"From a prevention standpoint in relation to a number of chronic diseases, we are already encouraging people to decrease intake of red meat," Lampe says. "These foods are typically our sources of carnitine."

A 2018 crossover study with 113 participants found that chronic consumption—defined as daily intake with around 258 mg/d of carnitine—of red meat increased levels of TMAO produced from carnitine and decreased TMAO excretion, but these levels decreased within four weeks of stopping eating red meat.<sup>29</sup>

"Given the uncertainty on this topic, relative to the overall body of evidence we have for CVD prevention, I tend to encourage folks not to focus on it too much," Klatt says, adding that other than current recommendations to focus on cardioprotective foods and limit red meat, making carnitine less of a concern, there are currently no evidence-based practice guidelines encouraging the planning of diets based around TMAO lowering.<sup>30</sup> "Focusing on the issue too much runs the risk of folks paying for expensive lab testing with limited known clinical utility." ■

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# *Transforming* Hospital Food Culture

## Plant-Based Meals on the Menu

By **Sheetal K. Parikh, MS, BSc, BSDN (Hons), RDN, LDN, FAND;**  
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**F**ood can serve as medicine, both in the community and health care setting. Dietary patterns rich in plant-based foods such as fruits, vegetables, whole grains, beans/legumes including soy, and nuts/seeds are endorsed by a robust body of evidence for inclusion in a healthful diet. A plant-based eating pattern is rich in these foods while limiting some or all (for vegan diets) meat, seafood, dairy, and eggs.<sup>1,2</sup> Whole food plant-based diets (PBDs) also typically eschew highly processed foods.<sup>3</sup>

### **Summarizing the Evidence**

Two primary reasons backing the recommendation for plant-based or plant-forward eating patterns include supporting population health and environmental or ecological health.

### **Health and Disease Risk**

Noncommunicable diseases (NCDs) such as CVD, cancer, chronic respiratory

diseases, diabetes, obesity, and cognitive impairment are among the leading causes of death and disability throughout the world. According to the World Health Organization, NCDs are responsible for 74% of all deaths globally.<sup>4</sup> Genetic, environmental, and modifiable lifestyle-related factors all contribute to NCD risk and PBDs may play a pivotal role in reducing the burden of these diseases. Adherence

to PBDs is linked to protective benefits for human health, including reduced risk of CVD mortality, pancreatic cancer, ischemic heart disease, and type 2 diabetes.<sup>5-8</sup>

Additionally, numerous studies show that PBDs are correlated with clinically significant decreases in blood pressure, LDL cholesterol, triglycerides, C-reactive protein, hemoglobin A1c, and insulin resistance.<sup>9-12</sup> The research also suggests a dose-response effect, with greater risk reduction and therapeutic benefits corresponding with consuming more plant-based meals.<sup>5,8</sup> The rising prevalence of costly chronic diseases therefore necessitates a call to shift toward plant-based dietary patterns and the food infrastructures that enable them.

Several major medical organizations, including the American Medical Association, the American College of Cardiology, and the American College of Lifestyle Medicine, recommend plant-based eating



patterns.<sup>13</sup> These endorsements underscore the therapeutic potential of PBDs in managing and preventing chronic diseases.

### Environmental Concerns

The Environmental Protection Agency details the contributors to greenhouse gas emissions, including transportation, electricity generation, industrial manufacturing, forestry, and agricultural practices.

The shift towards healthy plant-based meals may better support planetary health. The EAT-*Lancet* Commission report emphasizes that a planetary health diet—predominantly plant-based—could sustain both human and environmental health.<sup>14</sup> Reducing meat consumption, particularly red and processed meats, can significantly decrease greenhouse gas emissions, water usage, and land degradation,<sup>15</sup> offering a hopeful vision for a more sustainable future. Additionally, people who follow a PBD

account for 75% less greenhouse gas emissions than those who eat more than 3.5 oz of meat daily.<sup>14</sup>

### Changing Hospital Food Options

Hospitals and other health care institutions are uniquely positioned to lead the shift in dietary norms to encourage PBDs. By incorporating more plant-based meals into their menus, hospitals may help improve patient outcomes and set a standard for healthier eating habits. The American Medical Association has called for hospital menus to include plant-based meals and eliminate processed meats to promote better health.<sup>13</sup> Incorporating plant-based meals may also reduce food costs. Additionally, plant-based meals can benefit health care staff and visitors when offered on cafeteria menus.

Health care professionals, especially RDs and Dietetic Technicians, Registered (DTRs), can play a pivotal role in

supporting human and planetary health by understanding plant-forward dietary patterns and encouraging more of these menu options in hospitals and health care institutions. According to Elaine Eppler, a dietitian in the Neurosciences Unit at Vancouver General Hospital and Clinical Instructor at the University of British Columbia, “Dietitians play an essential role in ensuring new menu items meet nutrition standards to support patients’ healing and recovery, as well as encouraging staff and patients to try the new dishes and discover that plant-forward meals can be delicious and satisfying.”

While not all patients and staff will adopt a PBD, including some plant-based meals over the course of a hospital stay or workweek still confers health and environmental benefits, and these options can become a normalized part of health care menus as a synergistic component of treatment plans and workplace well-being.

The support of RDs in implementing a plant-forward menu cannot be overstated. Successful hospitals have centered the dietitian as the champion of the cause, playing a critical role in educating patients, foodservice staff, and members of the interdisciplinary care team. Although there is a large pool of research that details the health benefits of a PBD, implementation in an acute hospital setting can be met with skepticism. Early engagement and preservation of diner choice are important parts of addressing the most common concerns that clinicians have when recommending plant-based hospital menu options.

### Building a Menu

A strong partnership between the culinary team and the clinical team is crucial for creating a menu that is both medically appropriate and pleasing to the palate. The process should be focused on the following two things:

1. Using a variety of whole or minimally processed plant proteins, such as beans, legumes, whole grains, and tofu as the center of the plate; and
2. Meeting the protein needs of the most acutely ill patients.

The utilization of a variety of whole proteins can ensure that there is a diversity of essential amino acids necessary for protein synthesis while minimizing added sodium and the impact on food budget. For many people, a diet that is high in plant-based protein can meet patient needs for muscle growth and repair on par with a diet that contains animal protein.<sup>16,17</sup> However, RDs may have concerns regarding consuming an adequate amount of protein in relation to the volume of a plant-based dish. Concerns that a heavily plant-based menu is low in DHA, B<sub>12</sub>, iron, calcium, and vitamin D must also be addressed.<sup>18</sup> The clinical team can recommend the appropriate fortified foods and food pairings to improve nutrient adequacy and maximize bioavailability, filling any gaps identified in the menu during the planning process. From a nutrition counseling standpoint, the RD should offer proper patient education and support, including performing a high-quality assessment of individual dietary intake and absorptive capacity, when recommending any dietary approach.

### Expanding Plant-Forward Therapeutic Diets

Once a balanced menu with multiple plant-based options for a general diet has been established, the next step is to explore extending it across the spectrum of therapeutic diets where appropriate. High adherence to a PBD is associated with improvements in cardiovascular health, diabetes management, and a lower risk of cardiovascular morbidity and mortality in the general population, which makes it appropriate for a heart-healthy diet prescription.<sup>5,19</sup> A review of randomized controlled trials showed that lower-fat vegan diets, in particular, but also vegetarian diets, can improve glycemic control, weight, and cardiovascular risk factors in patients with type 2 diabetes,<sup>20</sup> suggesting that plant-based meals can be included for patients on a carbohydrate-controlled diet as part of a diabetes management plan.

There is also research that suggests a whole food-based PBD can be appropriate for patients with renal disease who would typically be prescribed a therapeutic diet low potassium, phosphorus, and protein-restricted. Due in part to the higher fiber content of many plant-based foods, dietary phosphorus, and potassium from less processed plant-based foods have lower bioavailability when compared with animal-based foods and some more highly processed foods.<sup>21</sup> Additionally, phosphorus in plant-based foods is present in the form of phytate, which generally has limited bioavailability in the digestive tract compared with animal-based products.<sup>21,22</sup> There is potential for plant-based menu items to be compliant with a renal diet with close collaboration with the renal dietitian and the nephrology team.

In contrast, for those patients that require a fiber-restricted diet, or modifications in texture due to chewing and swallowing difficulties, a strict plant-based diet can be contraindicated due to the presence of skins, peels, and fibrous parts posing a choking risk or potential gastrointestinal discomfort. Barring related concerns, patients with poor dentition may find many plant-based proteins softer and easier to chew than some meats.

### Soy, Cancer, and Hormones

Hesitation may remain for some around the addition of soy and soy products when building a plant-based menu. With earlier conflicting study results, some may believe that consumption of soy products

could increase the risk of cancer, specifically breast cancer, and disrupt androgens and estrogens in both men and postmenopausal women. Soy is a complete protein, containing all the essential amino acids necessary for muscle protein synthesis, and is high in fiber, antioxidants, and phytoestrogens. Recent research has found that a higher intake of soy and soy isoflavones is associated with a reduced risk of cancer in both men and women, suggesting soy may have a protective effect.<sup>23-25</sup> The American Cancer Society and the American Institute for Cancer Research have stated that moderate consumption (one to two servings daily) of soy foods is safe and may confer health benefits to all patients, including those with breast cancer.<sup>26,27</sup>

Some may also express concerns regarding consumption of soy products due to the presence of phytoestrogens and potential reduction of testosterone in males, leading to feminization and reduced sperm count. Despite the presence of phytoestrogens, consumption of soy products does not reduce the blood levels of total testosterone, free testosterone, or estradiol in male study participants.<sup>28</sup> Overall, soy-based foods within recommended amounts can be a healthy and safe addition to the menu. To help with change management and address any concerns, adding plant-based dishes to hospital menus can be done in stages, starting with a subset of patients on a regular diet, or one or two units initially.

### Plant-Forward Hospital Menus in Action

Gaining buy-in from hospital leadership and staff at all levels is key to successful menu shifts. Explaining the "why" behind menu changes, emphasizing the benefits of offering plant-based meals, and providing information on staff roles in the process is helpful. Offering short educational presentations, opportunities to ask questions, and providing samples of new dishes to taste goes a long way. Staff engagement events can include food and nutrition services staff, clinicians, and all patient-facing staff. Including the patient voice





through advisory board or community member participation in the process also helps ensure that menu revisions are culturally relevant to the populations served.

When a large menu project may seem daunting, it is okay to start small and scale up from there. In fact, it may be beneficial to begin by offering plant-based menu choices one meal per day or one day per week. Alternatively, menu initiatives can be kick-started during the beginning of the year, when many people are open to making changes or during National Nutrition Month. Greener By Default, a nonprofit that consults with institutions on increasing plant-based meal options while preserving diner choice for meat/dairy-based meals, suggests a three- to four-month pilot, gradually adding more nutritionally comparable plant-based dishes over time. This way, data can be collected to evaluate impacts before deciding on permanent implementation of menu changes.

New York City Health + Hospitals (NYCHH) has been on the leading edge of the shift toward more plant-based meals for patients, offering two plant-based chef's specials for lunch and dinner each day at 11 sites since the fall of 2022 while maintaining patient choice for other menu items. NYCHH's menu initiative began with a Meatless Monday rollout in 2019 and grew from there to piloting culturally relevant plant-based specials for lunch. Along the way, dietitians and culinary/food service team members engaged staff and clinicians in each unit about menu changes.

According to Samantha Morgenstern, vice president of operations at NYCHH, "The inclusion of all levels of hospital staff in the rollout of this initiative, from education to meal tastings, allowed leaders and

employees alike to embrace this change and become true ambassadors of the program." Colorful tray cart wraps and educational materials emphasized the power of whole plant-based foods for patient health and healing. NYCHH's model continues to be highly successful, with over 50% of eligible patients choosing plant-based meals and satisfaction rates above 90% for food served.

Vancouver Coastal Health in British Columbia, Canada, is also implementing new plant-based dishes across its system as part of a planetary health menu project, after an initial pilot in 2024. Dishes like a Korean-inspired Gochujang Bowl and Peanut Rice Noodle Bowl with Tofu added more diversity of proteins to their cycle menu and are more aligned with flavor preferences of their patient demographics. Eppler states, "Our team tested many recipes and moved forward with those that had the best patient reviews as well as met our goal of minimizing food waste."

Plant-based dishes added to patient or cafeteria menus must foremost be delicious and nourishing. In addition, behavioral science offers many evidence-based strategies that can be employed to increase selection of plant-based meals. Many of these can be found in the World Resources Institute's Food Service Playbook for Promoting Sustainable Food Choices.<sup>29</sup>

Greener By Default focuses on a subset of these strategies with hospitals, tailored to the food service operation and menu/ordering style. For example, hospitals with a smaller number of daily selections on a cycle menu can offer some protein-rich plant-based meals by default, providing patients with the choice to select an alternative meal with meat/dairy. Hospitals with room service style menus can change the ratio of meals on the menu to offer more plant-based options relative to meat-based options, which helps normalize these dishes for all diners, not just vegetarians or vegans. Other menu engineering strategies like reordering how dishes appear on menus and using titles and descriptions that emphasize flavors and preparation methods are also effective in increasing acceptance and uptake of plant-based meals.<sup>29</sup>

Before adding new menu items, it is important to establish baselines on nutrient content, types of foods procured, food cost, uptake of meals, and satisfaction with meals. The same data can then be collected during a menu pilot or the

first few months of using new menus, for comparison with baseline information to show project outcomes and fidelity to nutrition standards. Ideally, hospitals continue to collect data on key metrics over time to inform any further menu or operational changes desired.

## Conclusion

Dietitians and food as medicine initiatives often focus on increasing consumption of fruits, vegetables, legumes, nuts, and seeds after discharge. However, per Eppler, "Serving nourishing, plant-rich menu choices in the hospital models healthy eating for people and planet. It is a delicious way to nudge people (patients and staff) who are at different places in their plant-forward journey."

Many hospitals are adding plant-based meals to patient and retail menus, driven by changing patient demographics, health benefits, sustainability goals, and potential cost savings. RDs and DTRs have key roles to play in supporting, planning, and operationalizing menu shifts towards increasing plant-based options as this transformation of hospital food moves forward. ■

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## Gastroparesis: An Update

**G**astroparesis, also known as gastric stasis, is a disorder in which there is delayed gastric emptying without mechanical obstruction.<sup>1</sup> To further understand gastroparesis, it is important to first look at how digestion occurs. The stomach is an organ within the digestive system. It contains three muscle layers: the circular, oblique, and longitudinal layers. It has the ability to store meals, grind up solid food, and pump ground-up food/liquid into the small intestine via muscular contractions.<sup>2</sup> An anatomic sphincter is formed at the pylorus via thickening of the circular layer. Complex grinding is the result of the oblique layer. The “gastric pacemaker” is found in the midportion of the greater curvature. Pacer cells that are involved in electrical coupling with neighboring cells cause electrical activity and contractility to occur. The stomach’s ability for contractility can be changed by many different stimuli and conditions.<sup>1</sup>

Gastroparesis occurs when the stomach’s muscular contractions are impaired, causing a delay in the emptying of the stomach’s contents. Gastroparesis-like symptoms have been found in an

estimated 4% of the population, although the exact number of people suffering from gastroparesis is unknown. However, it is suggested that more than 1.5 million Americans suffer from severe gastroparesis. It can begin at any age, with the most common age of onset being 34. It is more commonly seen in women. In fact, 80% of those with gastroparesis are women.<sup>2</sup>

This continuing education course examines the etiology, symptoms, and treatment of gastroparesis. It explains the role of the care team in utilizing MNT and nutrition support for gastroparesis.

### Types of Gastroparesis

Gastroparesis results from many different diseases/disorders. Common causes include uncontrolled diabetes, postviral effects, connective tissue diseases (such as multiple sclerosis, muscular dystrophy, amyloidosis, scleroderma), side effects from medications (such as narcotics, tricyclic antidepressants, calcium channel blockers, progesterone, anticholinergic drugs), postsurgical effects (eg, damage to the vagus nerve following a gastrointestinal [GI] surgery), radiation therapy, cancer, hypothyroidism, eating disorders,

and chemotherapy. These causes are risk factors for developing the disorder, even if symptoms are not currently present. The ultimate cause of this disorder is due to damage to the peripheral nerves and muscles.<sup>3</sup>

### Diabetes and Gastroparesis

Gastroparesis is extremely common in those with diabetes. However, the exact number of those affected is questionable. Some research suggests that 11% to 18% of patients with diabetes have been found to have upper GI symptoms and 50% to 65% of these patients have been found to have gastroparesis when examined. Furthermore, some studies show that gastroparesis has been reported in 30% to 50% of patients with type 1 diabetes and 15% to 30% of those with type 2 diabetes.<sup>4</sup> Other statistics show that 40% of people with type 1 diabetes have gastroparesis and 30% of those with type 2 have it.<sup>5</sup> In these patients, gastroparesis typically results from nerve damage caused by poor glucose control rather than muscle damage.<sup>3</sup>

In people living with diabetes, the vagus nerve can become damaged over time due to hyperglycemia. Blood vessels deliver oxygen and nutrients to nerves. Nerves are bundles of different types of tissues that enable signals to cross between the brain and other body parts; they help control digestion.<sup>6</sup> Over time, high blood glucose levels can cause

COURSE CREDIT: 2 CPEs

### Learning Objectives

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

1. Explain the different types of gastroparesis and how they are identified.
2. Identify malnutrition in those with gastroparesis and nutrition-related issues affecting patients with gastroparesis.
3. Counsel clients on the different treatment options for gastroparesis and how to apply the role of nutrition support.
4. Identify how to assess clients with gastroparesis using MNT.

chemical changes in nerves and damage to blood vessels.<sup>5</sup> This type of damage is called autonomic neuropathy.<sup>6</sup>

There are several risk factors for neuropathy in those with diabetes. These include being overweight, having high blood pressure, having high cholesterol, having advanced kidney disease, over-consumption of alcohol, and smoking. In addition to hyperglycemia being a main cause of diabetic neuropathy, high triglyceride levels can contribute as well, leading to nerve damage. Nerves become deprived of adequate oxygen and nutrients, causing a decrease in function.<sup>6</sup>

### **Idiopathic Gastroparesis**

Another common form of gastroparesis is idiopathic gastroparesis, which has an unknown cause. This form of gastroparesis does not result from diabetes or gastric surgery. It is unrelated to endocrine, neurologic, or rheumatologic causes or medications that could cause gastroparesis. Some of the symptoms can overlap with dyspepsia, and some patients may have both functional dyspepsia and gastroparesis. Due to the similarities in symptoms shared by both dyspepsia and gastroparesis, it may be difficult to diagnose and distinguish between the two. Although most forms of gastroparesis display similar symptoms, idiopathic gastroparesis tends to more commonly cause abdominal pain vs diabetic gastroparesis. Nausea and vomiting tend to be more severe in diabetic gastroparesis.<sup>7</sup>

Per the Rochester Epidemiology Project, “definite” gastroparesis is defined as a diagnosis of “delayed gastric emptying by standard scintigraphy, symptoms of nausea and/or vomiting, postprandial fullness, early satiety, bloating, or epigastric pain for greater than three months.” Idiopathic gastroparesis is even more common than diabetic gastroparesis. Gastroparesis also more commonly occurs in women than men by three-fold. This holds true for all types of gastroparesis. Idiopathic gastroparesis is most commonly diagnosed in young or middle-aged women.<sup>7</sup>

Injury to the nerves or stomach muscles as a result of a virus is a potential cause for idiopathic gastroparesis. This diagnosis has been suggested in people who were previously healthy and then had an acute onset of illness caused by a virus, resulting in symptoms that persisted for more than three months with delayed

gastric emptying. Some virus culprits suspected of causing gastroparesis include cytomegalovirus, Epstein-Barr virus, and herpes varicella-zoster. Symptoms in these individuals tended to be less severe with a good prognosis and symptoms slowly resolving in many.<sup>7</sup>

A cross-sectional prospective case control study (n=30) looked at immune profiling from endoscopic biopsies of those with idiopathic gastroparesis. The authors of the study sought to determine if there was a difference in immune cells and gene expression in the stomach and duodenal bulb. Increases in innate and adaptive immune cells were found in gastroparesis. There were also positive correlations between immune cell types with duration of disease, proton pump inhibitor dosing, and delayed gastric emptying.<sup>8</sup> Although this research is in its infancy, it adds an additional potential layer to how gastroparesis is identified and treated.

### **Postsurgical Gastroparesis**

Postsurgical gastroparesis (PSG) has been seen in those who have undergone an upper abdominal surgery at a rate of 0.4% to 5%. PSG can also be a complication of pylorus-preserving pancreatoduodenectomy, which occurs in 20% to 50% of patients early in the postoperative period. PSG has been reported in 50% to 70% of patients who have undergone pancreatic cancer cryoablation. Frequency of PSG varies directly with both the type and number of gastric operations performed. A vagotomy could cause loss of gastric parasympathetic control through various mechanisms. The interstitial cells of Cajal also may reportedly play a role in the pathogenesis of PSG. Gastric phase III, which is also known as the third phase of digestion or intestinal phase, becomes compromised after a gastrectomy. Normal digestion during this stage occurs via the duodenum's response to chyme. Without the presence of a duodenum, there is no gastric phase III, which could result in gastric stasis.<sup>9</sup>

PSG can occur after a vagotomy for peptic ulcer surgery. Nissen funduplications (in which the fundus part of the stomach becomes wrapped around the lower esophagus to tighten the lower esophageal sphincter) used to treat gastroesophageal reflux disease (GERD) and bariatric surgery for severe obesity have been linked to an increase in PSG. PSG has also been seen in patients after heart and

lung transplants, which could be due to opportunistic viral infections or the result of immunosuppressive drugs, which can have motor-inhibitory effects. Many symptoms reported after abdominal surgery do resolve over time. This may occur due to an adaptation of the enteric nervous system to not having vagal “input” or reinnervation.<sup>10</sup>

There are two surgical interventions performed for gastric cancer: laparoscopic gastrectomy and open radical gastrectomy. Two risk factors for PSG in both surgeries are preoperative outflow tract obstruction and Billroth II anastomosis.<sup>11</sup> Billroth II anastomosis involves removal of the stomach antrum with creation of an anastomosis of the remaining stomach to the side of the jejunum.<sup>12</sup> Researchers found that patients who were more than 70 years old were also at risk for PSG if they had undergone an open radical gastrectomy. However, there was no increased incidence of PSG between either of the two surgical interventions.<sup>11</sup>

One study looked at the antroduodenal manometry recordings (records pressure waves produced in the stomach and small intestine) of 167 patients with gastroparesis between 2009 and 2019. Measurements were evaluated for fed period duration, number of phase III contractions (high amplitude contractions of the stomach and small intestine during hunger), migrating motor complexes (pattern of electromechanical activity in GI smooth muscle between meals), motility index (average of contractions in a time window of two minutes), and presence of neuropathic patterns. The fed period was significantly longer in those with idiopathic and diabetic gastroparesis vs those with postsurgical ( $p<0.05$ ). The number and duration of phase III contractions and migrating motor complexes were significantly lower in idiopathic and diabetic gastroparesis compared with postsurgical ( $P<0.01$ ); additionally, absence of migrating motor complexes during six-hour recording was observed more in idiopathic and diabetic gastroparesis ( $P<0.01$  and  $p<0.05$ ).<sup>13</sup>

### **Diagnosing Gastroparesis**

There are several symptoms that can indicate a diagnosis of gastroparesis. These include heartburn or reflux (GERD), nausea, vomiting of undigested food, feeling full earlier than normal, stomach bloating

or pain, and reduced appetite. Weight loss can occur due to taking in fewer calories than needed to meet one's needs and/or because of eating less than prior to experiencing these symptoms. Symptoms range from mild to severe and can be exacerbated by solid foods, fatty foods, high-fiber foods, and/or carbonated drinks.<sup>3</sup> Fatty foods and high-fiber foods already naturally take longer to digest, thus exacerbating symptoms in those with gastroparesis. Carbonated drinks can create a feeling of fullness, adding to the symptom of feeling full too early or exacerbating symptoms of GERD. Symptoms can greatly impair a person's quality of life and lead to disability in 1 out of 10 patients with gastroparesis. Gastroparesis symptoms typically follow a pattern of cycles with flare-ups, sometimes persisting for years.<sup>14</sup>

### Gastric Emptying Studies

There are several ways to diagnose gastroparesis. One way is a gastric emptying study. According to the Mayo Clinic, this is the most important test to use when diagnosing gastroparesis. A patient undergoing this test eats a light meal, such as eggs or toast, which contains a small amount of radioactive material. A scanner that can detect the movement of this material is put over the patient's abdomen and the rate at which food leaves the stomach is monitored, tracking how long it takes for the stomach to empty the meal. The test typically takes four hours to complete, and it's recommended that patients stop taking any medications that could potentially slow gastric emptying prior to the test.<sup>15,16</sup>

Two less common gastric emptying studies include a breath test and a wireless motility study. For a gastric emptying breath test, the patient eats a meal containing a substance that's absorbed in the intestines and passes into the breath. Samples of the breath are collected over four hours.<sup>16</sup>

In a wireless motility study, the patient swallows a small electronic motility capsule, known as a SmartPill. The capsule moves through the entire digestive tract and sends information, such as the rate of stomach emptying and how quickly liquid and food move through the large and small intestine, to a recorder that's either hung around the patient's neck or clipped to a belt. This capsule naturally passes through the body via a bowel movement.<sup>16</sup>

### Upper GI Endoscopy and Ultrasound

An upper gastrointestinal endoscopy is another test performed to diagnose gastroparesis. A tiny camera on the end of a long, flexible tube is used to examine the upper digestive system—including the esophagus, stomach, and duodenum of the small intestine—to determine whether any abnormalities exist. An ultrasound, wherein high-frequency sound waves are used to produce images of particular structures within the body, is another test method. For diagnosing gastroparesis, ultrasound images areas of the GI tract that may show abnormalities.<sup>15</sup>

### Upper GI Series

Another test used to diagnose gastroparesis is an upper GI series, which is performed with a series of X-rays. The patient drinks a white, chalky barium liquid, which coats the digestive system, highlighting any abnormalities.<sup>15</sup> Both the upper GI series and ultrasound tests can show intestinal obstructions that may indicate gastroparesis.<sup>16</sup>

### Complications

Several complications can occur because of gastroparesis, including GI obstruction, small intestinal bacterial overgrowth (SIBO), inconsistent blood sugar levels, and malnutrition.

### Obstruction

In more severe cases of gastroparesis, food residue left in the stomach can congeal to form an obstruction in the GI tract called a bezoar. This is a solid mass formed from undigested fibers. These fibers can include cellulose, hemicellulose, lignin, and fruit tannins. People with gastroparesis may need to avoid foods that contain these fibers to help prevent the formation of a bezoar. Certain medications, such as cholestyramine, sucralfate, enteric-coated aspirin, aluminum-containing antacids, and bulk-forming laxatives can also cause bezoars.<sup>15</sup> Increased nausea and vomiting may be a sign of the presence of a bezoar, which should be examined via endoscopy.<sup>15</sup> Treatment may include enzyme therapy, lavage, or endoscopic therapy to break up the bezoar using mechanical methods.<sup>15</sup>

### Bacterial Overgrowth

Gastroparesis patients, especially those who also have diabetes or have undergone a vagotomy, are at an increased risk of

developing SIBO, often marked by abdominal pain and bloating. One study of 50 participants with gastroparesis used a glucose breath test to detect the presence of SIBO. Of those participants, 60% had a positive breath test; SIBO was most common in those who had experienced symptoms of gastroparesis for a longer period.<sup>17</sup>

Diet may need to be altered in those with SIBO. Some may not be able to tolerate lactose or certain carbohydrates well. Treatment typically includes the use of antibiotics. Rifaximin has been found to have positive effects in improving symptoms and eliminating bacterial overgrowth in up to 80% of those who were treated with it. Treatment is typically a seven- to 10-day course and higher doses (1,200 or 1,600 mg daily) were found to be more effective than standard doses (600 or 800 mg daily).<sup>18</sup> A meta-analysis compared probiotic usage for treatment of SIBO to those without probiotic usage. Those who used probiotics for treatment had a significantly higher "decontamination rate" than those in the nonprobiotic group.<sup>19</sup>

### Worsened Diabetes

While diabetes can be linked to gastroparesis, particularly due to vagus nerve damage, gastroparesis itself can cause difficulties with blood sugar management, including sudden drops and wide variations in blood sugar in those who are insulin dependent.<sup>20</sup> In those with diabetes who haven't been diagnosed with gastroparesis, variable blood sugar measurements may indicate gastroparesis.

From a blood sugar standpoint, gastroparesis could be likened to skipping a meal. It takes much longer for digestion to occur and thus for glucose to be taken up into cells. The pyloric valve controls stomach emptying, which could occur partially within minutes and completely within three hours under normal circumstances. However, if the valve is closed tight, then the full stomach emptying could take several days. In this case, although the patient has eaten a meal, their blood sugar could drop within one to two hours after eating and rise suddenly several hours later. Thus, hypoglycemia is a major concern for people with diabetes who are insulin dependent, and the factor of unpredictability makes blood sugar management difficult.<sup>20</sup>

Fortunately for those who aren't insulin dependent (typically patients with type 2

diabetes), hypoglycemia is less of a concern and blood sugars are not typically as erratic. Only basal insulin will be released if the stomach doesn't empty. However, sulfonylurea medications and some orally administered hyperglycemic agents can still cause hypoglycemia, and the use of these medications should be considered for people with diabetes who also have gastroparesis.<sup>20</sup>

### Malnutrition

Malnutrition can occur in those with gastroparesis, typically due to lack of appetite and early satiety. This puts patients at risk of weight loss and poor oral intake. Nausea and vomiting, other gastroparesis symptoms, also can impair nutrient absorption. Comparing a patient's usual body weight with their current weight may be one indicator of malnutrition. A nutrition-focused physical exam confirms other signs, such as fat or muscle loss. Exact guidelines for determining malnutrition will vary by facility, but the American Society for Parenteral and Enteral Nutrition provides universal guidelines. Those at risk are typically identified using the following criteria: They're at less than 80% of their ideal body weight, have a BMI lower than 20, have lost 5% of their usual body weight in one month, or have lost 10% of their usual body weight in six months.<sup>21</sup>

### Treating Gastroparesis

Health care professionals can have a significant impact on gastroparesis treatment through diet education and lifestyle recommendations. Medications and dietary changes are often first-line treatments. If necessary, additional interventions, such as gastric pacemakers, gastric electrical stimulation, or a venting gastrostomy, are used. Nutrition support may also be necessary.

#### Diet

Proper nutrition can not only alleviate symptoms of gastroparesis but also help prevent malnutrition and dehydration. Typical MNT recommendations include following a low-fat, low-fiber diet; eating five to six small meals daily instead of two or three larger meals; and consuming softer, well-cooked foods or puréed/liquid foods.<sup>12</sup> Additional recommendations include chewing foods well, avoiding carbonated beverages and alcohol, hydrating well, and consuming sports drinks or oral rehydration solutions

as needed. Low-intensity exercise, such as walking, can be helpful after consuming a meal, and patients should avoid lying down for two hours after eating a meal. Depending on the patient's medical history and present status, vitamin/mineral supplementation may be necessary.<sup>22</sup>

#### Medications

Several medications are used to treat gastroparesis, typically prokinetic or promotility agents, which can help the stomach empty more quickly. Another common drug for gastroparesis that's been FDA approved since 1983, metoclopramide, has shown improvement in about 40% of patients in clinical trials. However, a potential side effect of taking metoclopramide is the serious movement disorder tardive dyskinesia, so it's not typically recommended to be taken for more than 12 weeks.<sup>23</sup>

Erythromycin is another common drug used to treat gastroparesis. This is an antibiotic similar in structure to motilin, which is a hormone that shortens stomach emptying time. Many people with diabetes are deficient in motilin, and researchers have determined that 40% of patients show an improvement in symptoms with only short durations of taking erythromycin. Domperidone is a drug used to increase muscle contractions within the stomach wall, but it's only available through a particular FDA program and typically not used in the United States.<sup>23</sup>

A randomized placebo-controlled trial (n=152) demonstrated promising results for the use of tradipitant, a drug currently under clinical trials, in patients with diabetic and idiopathic gastroparesis. Patients receiving tradipitant had a significant decrease in nausea at week four compared with placebo ( $p=.0099$ ) and significant increase in nausea-free days ( $p=.0160$ ). This was even greater for those with nausea and vomiting at baseline.<sup>24</sup>

While antiemetic agents are used to treat nausea and vomiting associated with gastroparesis, they don't treat gastroparesis itself. Initial, small research studies show a potential for botulinum toxin injections as a treatment, but overall results are mixed, and it's not typically recommended at this time.<sup>23</sup>

#### Gastric Pacemaker

Another treatment for gastroparesis is laparoscopic surgical placement of a gastric pacemaker. The gastric pacemaker

includes a neuroregulator to send signals to the vagus nerve to help regulate digestion, a lead system that controls the electrical pulses sent to the vagus nerve, and an external control system to allow the patient to adjust settings.<sup>25</sup>

One study demonstrated success of this procedure in its treatment of gastroparesis. A group of 25 patients with gastroparesis (19 with diabetic gastroparesis, three with postsurgical gastroparesis, and three with idiopathic gastroparesis) had gastric pacemaker implantation between April 1998 and September 2000. All of these participants demonstrated delayed gastric emptying via radionuclide study. Results showed that both severity and frequency of nausea and vomiting improved significantly at both three and 12 months, and gastric emptying time shortened.<sup>26</sup>

#### Gastric Electrical Stimulation

Another form of treatment for gastroparesis is gastric electrical stimulation (GES). Low-energy electrical stimuli are transmitted into the muscularis propria portion of the stomach, with a frequency above the normal activity of three cycles per minute seen in gastric slow waves. This treatment differs from gastric pacing due to the frequency delivered. A meta-analysis performed by the National Institutes of Health shows the potential this type of treatment holds for those with refractory gastroparesis. Significant decreases in nausea and vomiting, need for enteral and parenteral nutrition support, and improvement in gastric emptying were seen.<sup>27</sup>

The benefits of this treatment option can also be seen in patients with both diabetes and gastroparesis. One study looked at a retrospective review of 48 adult patients with diabetes who underwent GES. There was significant improvement in upper GI symptoms (eg, vomiting, early satiety, bloating, and postprandial fullness), health-related quality of life, nutritional status, glucose control, and hospitalizations at both six and 12 months, with low complication rates.<sup>28</sup>

#### Gastric Peroral Endoscopic Myotomy

Gastric peroral endoscopic myotomy (G-POEM) is a new procedure developed by Mouen Khashab, MD, at John Hopkins Medicine. G-POEM involves an endoscope being inserted through the mouth to cut the muscles near the pyloric sphincter, to

help relax the sphincter and allow food to empty freely.<sup>29</sup> A study found significant improvement in symptoms and gastric emptying at six months postprocedure in patients who had undergone G-POEM vs sham procedure ( $p=0.005$ ).<sup>30</sup>

### Venting Gastrostomy

A venting gastrostomy may also be used to help relieve symptoms of gastroparesis. An opening is created in the abdominal wall and a tube is placed into the stomach. Stomach contents can then flow out to relieve pressure in the stomach.<sup>22</sup> Venting gastrostomies are typically used for those experiencing nausea, vomiting, and bloating. Gastrostomy-jejunostomy tubes may be used to provide gastric decompression and enteral feedings simultaneously.<sup>31</sup> Fluid and electrolyte balance will require close monitoring and additional IV fluids will likely be needed.

### Nutrition Support

If the gastroparesis symptoms are severe and/or a significant weight loss has occurred, nutrition support may be warranted. Oral or nasal feeding tubes may be placed into the small intestine. If the tube feeding is needed long term, then a jejunostomy tube is typically placed for feeding. This tube goes into the jejunum, a part of the small intestine, therefore bypassing the stomach. Another option is a percutaneous endoscopic transgastric jejunostomy, which enables both decompression and feedings.<sup>21</sup>

Patients with a jejunostomy tube cannot tolerate bolus feeds, but most can consume a standard, polymeric formula. If a gastric tube is used/tolerated, then a more calorically dense formula may be necessary. For those who have problems with bacterial overgrowth, a no-fiber formula is recommended. If tube feedings are not tolerated, then parenteral nutrition may be needed as a last resort. In that case, clinical status and labs should be monitored closely.<sup>21</sup> Some will experience refractory gastroparesis and be able to return to eating orally.<sup>16</sup>

### Nutrients of Concern

Patients with gastroparesis are at risk of malabsorption of several nutrients. Iron-deficiency anemia is of particular concern, usually due to red meat intolerance, reduced gastric acid production from the use of proton pump inhibitors, or a

vagotomy. Iron supplementation may be necessary, and the oral route is preferred. Recommendations are to supplement with 200 mg of elemental iron daily. Iron replacement therapy is usually given three times per day and each dose is recommended to be given six hours apart. Vitamin C may enhance iron absorption and the addition of 25 to 50 mg is recommended with each iron supplement as well.<sup>21</sup>

There may be a vitamin B<sub>12</sub> deficiency following a gastrectomy due to reduced levels of gastric acid and/or intrinsic factor. Bacterial overgrowth and a reduction in vitamin B<sub>12</sub>-rich foods may also be contributing factors. Supplementation dosing depends on severity of deficiency. Supplementation recommendations for mild deficiencies is 500 to 1,000 mcg/day. Severe deficiencies may require intramuscular or subcutaneous injections of 100 to 200 mcg monthly. Of note, the percentage retained from larger doses of vitamin B<sub>12</sub> is less than in lower doses.<sup>21</sup>

Vitamin D is also of concern for patients who have undergone gastrectomies, usually due to reduced lactose intake and/or poor absorption and metabolism of vitamin D. This can result in accelerated bone loss and lead to osteoporosis. There are guidelines for supplementation of vitamin D and calcium. Recommendations for patients with bone disease are 1,500 mg of calcium and 800 IU of vitamin D daily. Maximal absorption occurs when calcium is provided in doses of 500 mg or less.<sup>21</sup> Calcium citrate is more easily absorbed and is also preferred for those who take histamine-2 blockers or protein-pump inhibitors.<sup>32</sup> One meta-analysis found that vitamin D<sub>3</sub> was more effective at increasing serum 25(OH)D concentrations in comparison with vitamin D<sub>2</sub>.<sup>33</sup>

### Putting It Into Practice

When assessing patients or clients with gastroparesis, there are several things to bear in mind. Weight loss is a common occurrence, so current body weight at each follow-up should be compared with baseline body weight. Weight status along with oral intake and/or signs of fat/muscle wasting could determine a possible malnutrition diagnosis.

Dietitians play a crucial role in the lives of those with gastroparesis. Providing recommendations for a low-fat, low-fiber diet and five to six small meals per day is

standard for many patients. However, each patient's plan of care will be individualized. Most patients will have no delay in emptying liquids, despite a delay in emptying solids. Patients typically have increased difficulty with solids as the day goes on and do better with liquids later in the day. They also may be able to better tolerate puréed foods at this time because, once puréed foods are mixed with saliva and gastric secretions, they become liquefied.<sup>21</sup>

Clinicians can educate and work with patients and clients to individualize their needs and improve their caloric and nutrient intake, which can help alleviate symptoms and improve quality of life. If nutrition support is warranted, recommending the appropriate route of feeding and formula for the patient is critical. Individuals able to tolerate enteral nutrition typically are fed via jejunostomy tube. The goal is always to prevent unplanned weight loss and malnutrition. In addition, working with the gastroenterology team is important for providing the best plan of care for the patient. If the patient does not currently visit a gastroenterology specialist, recommending or referring them to one should be part of the care plan.

There are a number of ways care providers can collaborate in treating patients with gastroparesis. RDs will be able to best assess which nutrients may require supplementation and are the experts in providing recommendations for enteral and parenteral nutrition. RDs may also assist in helping patients achieve or maintain an appropriate weight.

Any client who shows significant symptoms of gastroparesis, experiences significant weight changes, is unable to tolerate a diet by mouth, or has had a significant functional change occur would be a candidate for consultation; the involvement of a gastroenterologist will benefit patients as well. ■

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Lauren Botelho, MS, RD, LDN, is a dietitian in the Boston area. Botelho has worked in inpatient settings, outpatient settings, and long-term care. She has a BFA in writing, literature, and publishing, and is a freelance nutrition writer. Additionally, Botelho is a family nurse practitioner who works in gastroenterology.

For references, view this article on our website at [www.TodaysDietitian.com](http://www.TodaysDietitian.com).

# CPE Monthly Examination

**1.** What are two main causes of gastroparesis?

- a. Muscle damage and poor nutrition
- b. Nerve damage and muscle damage
- c. Nerve damage and decreased gastric acid
- d. Poor nutrition and decreased gastric acid

**2.** What are the three main types of gastroparesis?

- a. Diabetic, idiopathic, postsurgical
- b. Idiopathic, postsurgical, renal
- c. Diabetic, renal, idiopathic
- d. Diabetic, postsurgical, nutrient deficient

**3.** Which percentage of those affected by gastroparesis are women?

- a. 5%
- b. 80%
- c. 25%
- d. 50%

**4.** Which nutrients can exacerbate gastroparesis symptoms?

- a. High fat, low fiber
- b. High fiber, low fat
- c. High fat, high fiber
- d. Low fat, low fiber

**5.** What is a major concern for type 1 diabetics with gastroparesis?

- a. Elevated A1c
- b. Hypoglycemia
- c. Decreased appetite
- d. Weight gain

**6.** What are two potential indicators of malnutrition in patients with gastroparesis?

- a. A 5% weight loss in one month and poor oral intake
- b. A 10% weight loss in one year and poor oral intake
- c. A 5% weight gain in one month and nausea
- d. A 10% weight gain in one year and vomiting

**7.** What type of medication is typically recommended for patients with gastroparesis?

- a. Calcium channel blockers
- b. Statins
- c. Sulfonylureas
- d. Prokinetic agents

**8.** What nutrients are at risk of deficiency in patients who have undergone vagotomies and gastrectomies?

- a. Thiamine, niacin, folic acid
- b. Iron, vitamin D, vitamin B<sub>12</sub>
- c. Vitamin D, thiamine, niacin
- d. Folic acid, thiamine, vitamin B<sub>12</sub>

**9.** Most patients with gastroparesis will have preserved function of which of the following?

- a. Emptying of solids
- b. Emptying of supplements
- c. Emptying of liquids
- d. Emptying of high-fat foods

**10.** What are two complications from gastroparesis?

- a. Malnutrition and obstruction
- b. Obstruction and weight gain
- c. Bacterial overgrowth and weight gain
- d. Worsened diabetes and increased appetite

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# HERE'S A PREVIEW OF OUR 2025 SPRING

## Sunday, May 4

TIME	EVENT/SESSION	PRESENTER/INSTRUCTOR	ROOM
12:30 PM – 2:00 PM (1.5 credits)	<b>Leveraging Culinary Medicine to Promote Health Equity*</b>	Christina Badaracco, MPH, RDN, LDN; Heidi Davis, MSW; Theresa Stone, MD, FACP, DipABLM	TBD
2:10 PM – 3:25 PM (1.25 credits)	<b>Overcoming Systemic Barriers</b> <i>Implementing the AAP's New Pediatric Obesity Guidelines in Health Care*</i>	Andie Lee Gonzalez, PhD, MPH, RDN, LD, FAND; Kimberly Avila Edwards, MD; and Erika Estrada-Ibarra, BSN, RN	TBD
3:35 PM – 4:50 PM (1.25 credits)	<b>How to Improve Fertility Outcomes (In the Kitchen)*</b>	Judy Simon, MS, RDN, CD, CHES, FAND, and Angela Thyer, MD	TBD

## Monday, May 5

TIME	EVENT/SESSION	PRESENTER/INSTRUCTOR	ROOM
8:00 AM – 9:15 AM	<b>Breakfast Presentations</b>		TBD
9:45 AM – 10:45 AM (1.0 credit)	<b>Whole Child Healthy</b> <i>Helping Families Resist Dichotomies, Bias, and Stigma</i>	Jill Castle, MS, RDN, LDN	TBD
	<b>The Polyphenol Effect: Gut Microbiome, Inflammation, and the Brain</b> <i>A Research-Based Approach to Culinary Medicine for Cognitive Health</i>	Maggie Moon, MS, RDN, and Britt Burton-Freeman, PhD	TBD
10:55 AM – 11:55 PM (1.0 credit)	<b>Intuitive Eating</b> <i>Is This Framework Right for Everyone?</i>	Carrie Dennett, MPH, RDN	TBD
	<b>Dynamic Duo</b> <i>How Teaming Up Can Help Your Business Thrive</i>	Jackie Topol, MD, RDN, CDN, and Kristy Del Coro, MS, RDN, LDN	TBD
12:25 PM – 1:40 PM	<b>Lunch Presentations</b>		TBD
1:40 PM – 3:40 PM	<b>Exhibit Hall</b>		TBD
3:40 PM – 4:55 PM (1.25 credit)	<b>Enhancing Nutrition Outcomes Through Interdisciplinary Collaboration</b> <i>A Comprehensive Approach*</i>	Arlayna Jackson, MDS, RDN, LDN, and Claire Daniels, CCC-SLP, ADOR	TBD
	<b>Life After GLP-1 Agonist Therapy for Weight Loss*</b>	Su-Nui Escobar, DCN, RDN, FAND	TBD

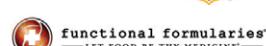
\*Interprofessional Continuing Education session (IPCE)

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All times shown are Central Daylight Time. Presenters and agenda timing are subject to change.

# SYMPOSIUM SCHEDULE

## Tuesday, May 6

TIME	EVENT/SESSION	PRESENTER/INSTRUCTOR	ROOM
8:00 AM – 9:15 AM	<b>Breakfast Presentations</b>		TBD
9:45 AM – 11:15 AM (1.5 credits)	<b>What's Eating Your Clients?</b> <i>Understanding Epigenetics and Early Childhood Feeding Experiences to Solve Eating Problems*</i>	Jessica Setnick, MD, RDN, CEDS-C, and Carrie Lutter, LCSW, RDN	TBD
	<b>Get Psyched</b> <i>Using the Power Combo of Sports Psychology and Sports Nutrition*</i>	Dana Angelo White, MS, RDN, ATC, and Devin Markle, PsyD, M.Ed, LPC	TBD
11:15 AM – 1:15 PM	<b>Exhibit Hall</b>		TBD
1:15 PM – 2:30 PM	<b>Lunch Presentations</b>		TBD
3:00 PM – 4:00 PM (1.0 credit)	<b>How to Ditch Dietitian Dissatisfaction and Make the Most of Your Career</b>	Bonnie Taub-Dix, MA, RDN, CDN	TBD
	<b>Freedom in Cooking</b> <i>Empowering Nutrition and Health Through Accessible Home Kitchens</i>	Rene Pearson, RDN, LDN, and Maegan Blau	TBD
4:05 PM – 5:20 PM (1.0 credit and 1.25 credits)	<b>Creating Enticing Nutrition and Culinary Messaging to Increase Engagement and Participation</b> (1.0 credit)	Jesscia Ball, MS, RD	TBD
	<b>A Pivotal Life</b> <i>The Diabetes Management Journey From a Health Care Professional and a Person Living With Diabetes</i> (1.25 credits)	Toby Smithson, MS, RDN, LD, CDCES, FAND, and Jason Baker, MD	TBD

## Wednesday, May 7

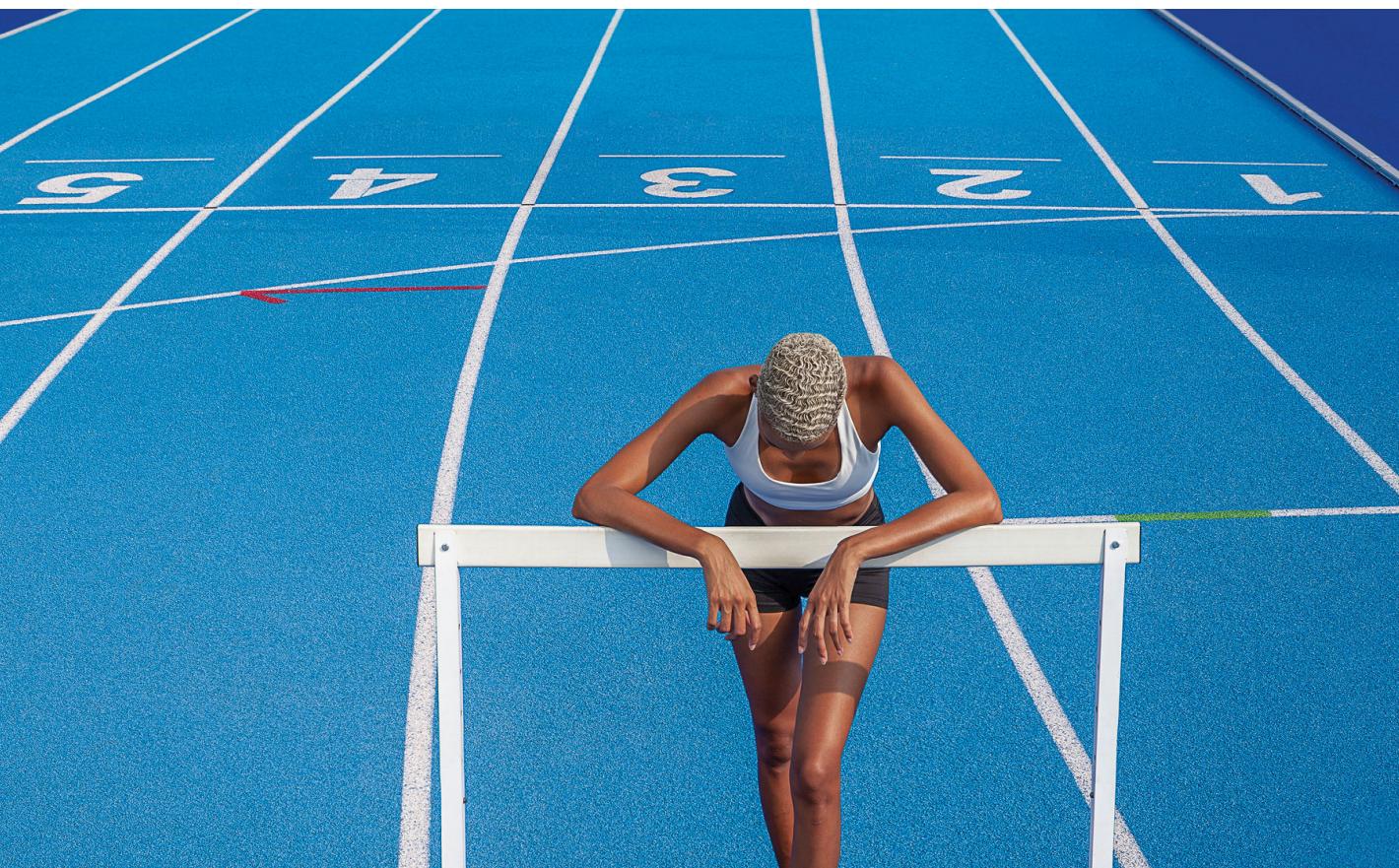
TIME	EVENT/SESSION	PRESENTER/INSTRUCTOR	ROOM
8:00 AM – 9:15 AM	<b>Breakfast On Your Own</b>		TBD
9:45 AM – 10:45 AM (1.0 credit)	<b>Institutional Mistrust</b> <i>The RD's Role in Restoring and Rebuilding Faith in Public Health and Evidence-Based Nutrition</i>	Jackie London, MD, RDN, CDN	TBD
10:55 AM – 11:55 PM (1.0 credits)	<b>Ask the Expert</b> <i>A Year in Review and a Look Ahead</i>	Toby Amidor, MS, RDN, CDN, FAND	TBD

\*Interprofessional Continuing Education session (IPCE)

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# The Mindset of Retirement

Supporting Athletes as They Move on From Athletics

The journey of a competitive athlete is a long, rewarding, complex, exhilarating, and commonly soul-crushing experience that often spans decades. Issues involving identity, team dynamics, family, winning and losing, illness, injury, and, yes, nutrition come into play every step along the way. When a sports career comes to an end, athletes are left with a variety of physical and psychological reactions. High school, college, professional, or master athletes all eventually face hanging it up. This can be due to eligibility expiring or because their mental or physical health warrants it. When that time does come, it is a mixed bag of experiences. As a sports dietitian and certified athletic trainer working within these professions for nearly 20 years, I continue to work toward finding better ways to help athletes navigate this interesting and unavoidable part

of their careers. This article will explore some nutritional and mental health strategies to help RDs assist athletes in managing the highs and lows of this bittersweet time.

## Mindset

"Now that I'm not an athlete anymore ..." It had been exactly three days after the end of the season, and the athlete sitting in front of me was asking how she should eat "going forward"—like for the rest of her life! The final season of her college career had ended just 72 hours earlier, and she honestly believed that everything she knew about nutrition was supposed to drastically change. She went on to explain some exciting plans she had for the upcoming semester and after graduation but kept saying, "Since I'm not an athlete anymore" over and over. She didn't seem outwardly upset or mournful,

but later in the meeting, she started crying about something one of her coaches had said two years earlier. It was raw. It was easy to see she was all over the place, processing it all. When you dedicate so much time and effort to one thing for so many years, and suddenly, you're relieved of the obligations, it can be jarring. No more reporting to practice, traveling for competitions, getting up at ridiculous times in the morning for lift, and now you get to call the shots. It's a lot, and it can be completely overwhelming. Often gripping for control, overeating habits come to the forefront. This normal reaction is something many athletes face, but what they often overlook is the simple fact that they'll always be an athlete, the job description just looks a bit different.

Athletes struggle with identity when careers end, and this can impact their nutritional habits and the amount of

physical activity they do in their free time. A study published online in 2018 illustrated a decline in identity, nutrition scores, and physical activity for former athletes as compared with athletes still participating in their sport.<sup>1</sup> This study also determined that former athlete status may not ensure a commitment to regular exercise once their career has ended.

Some athletes are relieved when their career draws to a close. Maybe the injury management had become too much, or they felt they gave all they could to their sport. The perspective will likely shift over time, which is why having support through this new portion of the journey can be helpful.

There are a series of challenges athletes commonly face as they transition away from their sport, as Devin Markle, PsyD, LPC, a licensed professional counselor and sports psychologist at Quinnipiac University in Hamden, Connecticut, sees in her role. "Many athletes find it challenging to channel their competitive mindset into their 'new' life," Markle says. There are also different hurdles for athletes who stop playing due to graduation vs those who need to end due to injury. "Many of my athletes have found it difficult to navigate without teammates with the same mindset. An athlete graduating has a sense of closure, yet those who are forced to retire early due to injury often struggle with not being able to end on their own terms. This can make the transition more difficult as they may feel that their athletic experience was incomplete," Markle adds.

Teams aren't perfect, but many are like families, you love them for better or worse. Markle points out how this loss can also impact how an athlete feels once that

relationship is forced to change. "One of the other challenges is losing a support system in a team. It can feel isolating going from having a team and a support staff to going out independently."

### **Role of the Sports RD**

As a key member of the team support staff, the sports RD can play an integral role in setting up athletes for success in the next stage of their lives. The following are five ways dietitians can help guide athletes in their nutrition needs.

#### **1 | Conduct a Needs Assessment**

Clinicians need to provide a needs assessment at the end of athletes' careers to help tailor education and resources. Surveys, workshops, and activities with retired athletes can provide a comfortable and familiar space for athletes to share and find common ground with their peers.

#### **2 | Support Eating Regularly**

Athletes are tempted to stop eating on a schedule once the demands of their days become less strenuous. Even though their schedules are more flexible, it's still important to maintain healthful habits like eating regularly throughout the day and making time for pre- and postworkout fueling.

#### **3 | Snack Differently**

Competitive athletes are prone to endless snacking, especially to help accommodate the demands of their training schedules. The once crucial reliance on large amounts of high-calorie and high-carb snacks and drinks to fuel long training sessions may not be as necessary or as frequent. Educate on properly portioned

snacks and hydration options to help fuel less strenuous exercise regimens.

#### **4 | Take Advantage of the New Schedule**

Now, they get to call the shots! Encourage athletes to experiment with new types of exercise and more casual forms of physical activity.

Athletes may also benefit from education on the importance of proper sleep and time management.

#### **5 | Explore Cooking**

Lots of athletes report not having time to cook as much as they would like during high-volume training cycles. Now, they have the opportunity to sharpen their culinary and meal prep skills at any level. RDs can provide new recipes and, if possible, opportunities for food-based activities they never had the time for while training, such as engaging in cooking demos, classes, and shopping instruction less focused on performance nutrition.

#### **Sports Psych Troubleshooting**

As the weeks and months progress, athletes begin to find a new normal around food and activity, and there are some strategies mental health experts suggest to help manage the process. "I often recommend that athletes write out all the traits that have made them successful athletes. I then challenge them to find ways to apply these traits to a new challenge or career. For example, loyalty, dedication, and grit. I also recommend that they seek out careers or social groups that value those same characteristics," Markle says. Finally, Markle recommends pointing athletes in the direction of counseling or continuation of counseling if they received treatment while part of the team. "Counseling is always an important resource. For athletes adjusting, I think it can be a great way to reflect on a new identity and self-exploration." ■

Dana Angelo White, MS, RDN, ATC, is a dual registered dietitian nutritionist and certified athletic trainer with over 20 years of clinical experience. She is a media dietitian, cookbook author, and full-time professor and sports RDN at Quinnipiac University in Hamden, Connecticut.

***Athletes struggle with identity when careers end, and this can impact their nutritional habits and the amount of physical activity they do in their free time.***

For reference, view this article on our website at [www.TodaysDietitian.com](http://www.TodaysDietitian.com).



## Taylor Wolfram

Body Liberation and Social Equality

**B**eing comfortable in your skin and loving your body are great messages to internalize in a society that puts physical flaws under a microscope, but for Taylor Wolfram, MS, RDN, LDN, this is the jumping-off point in the quest for body liberation.

Body liberation “gets at the systems of oppression that impact people, their relationship with their bodies, and how they’re treated in society by other people and health care and government systems,” Wolfram says. “Body liberation is trying to break free from all that.”

Wolfram says the choices we make and how we approach these social systems help redefine what health and wellness mean while also pushing back against organizations that profit off internalized negatives—such as the diet and weight loss industries that leverage body shaming for sales.

Antidiet dietitians don’t believe in focusing primarily on weight loss, over-restricting foods, or defining individual foods as inherently “good” or “bad.” It was an approach that clicked with Wolfram—who earned her master’s degree from Illinois State University and her bachelor’s at Case Western Reserve University.

“It really jived with my values and the kind of work that I wanted to do,” Wolfram says. “It was also an area that I knew there was immense need for in terms of

disordered eating and chronic dieting, which are just so prolific. I had my own history with that ... so I was happy to move in that direction.”

By helping her clients find ways to nourish their bodies that feel connected, accessible, flexible, sustainable, and compassionate, Wolfram supports them in attaining their health goals—which aren’t intentional weight loss. Rather, she helps them learn about themselves and how to feel more knowledgeable and confident in their food-related decisions.

**Today's Dietitian (TD): When did you realize you wanted a career in nutrition?**

**Wolfram:** I was premed but was looking for a new path after I realized it just wasn’t for me. I still wanted something in health care because I wanted to help people feel better, but I wanted to do something where I could get to know patients better and spend more time with them. I also wanted to do more lifestyle and behavioral work, not just medicine. I’d always been interested in nutrition and was already taking classes, so I connected with a faculty member who became my mentor. The rest is history.

**TD: What did your roles as manager of evidence-based practice and manager of dietetics content for the Academy of Nutrition and Dietetics (the Academy) entail?**

**Wolfram:** The evidence-based practice role was essentially project management for the Academy’s Evidence Analysis Library, where evidence-based nutrition practice guidelines and systematic reviews are published. I kept the contributing workgroups on track and on deadline. After a couple of years, I wanted something a little different. The Academy had created the dietetics content role to manage content for the eatright.org website and to serve as associate editor of *Food & Nutrition Magazine*. It was part of the communications team—which hadn’t had an RD on it before—and involved writing, editing, and producing. It was fun, and I learned a lot.

**TD: What made you take the leap into consulting?**

**Wolfram:** My work with the Academy scratched the itch in terms of getting to write, learn, and talk about a variety

of topics in mainstream nutrition. But I wasn't working with people on a counseling level, which is why I got into the field. I started a private practice on the side but eventually started to burn out doing both. I needed to find more balance. I didn't want to do counseling full-time, nor did I want to work at a desk full-time, so I decided to dedicate all my time to my practice.

**TD: How did you get started as a consultant reviewing research and nutrition recommendations for**

**VeganHealth.org?**

**Wolfram:** Shortly after going into private practice full-time, Jack Norris, a vegan dietitian and cofounder of the Vegan Outreach advocacy group, reached out about helping with VeganHealth.org, which provides evidence-based nutrition guidance for vegans. I loved it; it was the balance I was looking for. It was a real moment of feeling like I could fill an important space in the vegan RD field.

**TD: What inspired you to specialize in recovery from chronic dieting and disordered eating, intuitive eating, and body image?**

**Wolfram:** This happened organically for me. I was never a huge weight loss dietitian, even though it's something we're all trained in and I did get certified in adult weight management by the Academy. In the beginning, I had weight loss clients, but it felt so disheartening because they were trying so hard but not seeing results. I was pulling out all the tools I had, and everything I was taught, but long-term sustainable weight loss wasn't happening. This was when intuitive eating started to take off. It made sense to me. There was a big overlap with social justice. It clicked with my experience with my weight loss clients and my own history. So now I'm first and foremost a weight-inclusive, anti-diet dietitian. Within that, I have a sub-specialty of vegan nutrition.

**TD: How do you integrate social justice and inclusivity into your nutrition counseling, and why?**

**Wolfram:** It really depends on the client. I don't have a 10-step program or anything like that. That's what I love about getting more skilled as a counselor—you feel more comfortable about letting it flow. Some clients come in already educated

*By helping her clients find ways to nourish their bodies that feel connected, accessible, flexible, sustainable, and compassionate, Wolfram supports them in attaining their health goals.*

and passionate about social justice, and we talk about it right out of the gate. Some aren't, and that's fine. But usually, somewhere along the line, we'll talk about systems and oppression, diet culture, and why we feel the way we do about our bodies. It's important to open all of that to get to the shame people feel because it can be incredibly healing and an opportunity for them to build self-compassion so they can take better care of themselves.

**TD: What prompted you to earn your Befriending Your Body Teacher certification?**

**Wolfram:** It was created by a somatic therapist, Ann Saffi Biasetti, PhD, LCSW, ERYT, and is based on her eating disorder research. I do the program with my individual clients once they're in a stable place with food and nutrition. It's just so incredible because not only is it teaching them skills, empowering them, and deepening their healing, but after the eight-week program, we have a new shared language and skills that we can integrate into our work moving forward. It's empowering for me as a dietitian because it taught me so much more that I can do with my clients, and the results I've seen from it have been incredibly impactful. The Befriending Your Body program has been a bright, shining beacon that's empowering for me and my clients.

**TD: What does your typical workweek look like?**

**Wolfram:** I had our second baby six months ago, and I'm back to going into the office three days a week instead of working only at home. I'm part dietitian, part stay-at-home mom. It's a great fit that really works for me. When I have an opening, I'll do podcast interviews or a very limited number of speaking engagements, but I'm mostly just counseling.

**TD: What do you do in your downtime?**

**Wolfram:** What is downtime (laughs)? We have a 6-month-old and a 2-year-old, so life is generally very demanding right now. When I do have extra time or energy, I read for fun.

**TD: What are some of your favorite meals or foods and why?**

**Wolfram:** There are a couple things that I really love. Pad Kee Mao is a spicy Thai noodle dish with vegetables and Thai basil, and I get it with tofu. It's just so flavorful and delicious. I also love a Vietnamese noodle salad with peanut sauce that I get with tofu; again, so much flavor! I also love a good breakfast sandwich. It's so yummy, savory, satisfying, and filling.

**TD: What are your favorite hobbies and why?**

**Wolfram:** Hobbies are something I've really struggled with, even before I had kids. I just never had them, although I know I should. It's a big personal development goal.

**TD: If we were to peek into your pantry or refrigerator, what would we find?**

**Wolfram:** So many things! I always have tofu, soy milk, almond milk, hummus, and seeds like flax, hemp, and chia. We always have greens, usually spinach and kale. And a refrigerator door full of condiments, dressings, and other flavorful things. I have lots of frozen fruit and veggies and vegan meats—I like to stock up when things are on sale. I also usually have vegan cheese. In the pantry are lots of beans and lentils, nuts and nut butters, chips, crackers, pasta, and pasta sauce. ■

Elizabeth S. Goar is a freelance health care writer in Benton, Wisconsin.

## 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.

**FEBRUARY 11-13, 2025**

**Connected Health & Fitness Summit**  
Los Angeles, California  
<https://connectedhealthandfitness.com>

**FEBRUARY 19-21, 2025**

**Sports & Active Nutrition Summit USA**  
San Diego, California  
<https://sportsnutritionsummit-usa.com>

**MARCH 3-7, 2025**

**National School Breakfast Week**  
<https://schoolnutrition.org>

**MARCH 9-11, 2025**

**School Nutrition Association Legislative Action Conference**  
Washington, D.C.  
<https://schoolnutrition.org>

**MARCH 22-25, 2025**

**American Society for Parenteral and Enteral Nutrition 2025 Nutrition Science & Practice Conference**  
Columbus, Ohio  
<https://nutritioncare.org>

**MARCH 25-26, 2025**

**13<sup>th</sup> American Food Sure Summit**  
Atlanta, Georgia  
<https://americanfoodsure.com>

**MARCH 28, 2025**

**Pennsylvania Academy of Nutrition and Dietetics Annual Conference**  
Malvern, Pennsylvania  
<https://eatrightpa.org>

**APRIL 11, 2025**

**Maine Academy of Nutrition and Dietetics Annual Conference**  
Portland, Maine  
<https://eatrightmaine.org>

**APRIL 14-18, 2025**

**National CACFP Association 39<sup>th</sup> Annual Child Nutrition Conference**  
Dallas, Texas  
<https://www.cacfp.org>

**APRIL 23-27, 2025**

**Obesity Medicine 2025**  
National Harbor, Maryland  
<https://obesitymedicine.org>

**MAY 4-7, 2025**

**Today's Dietitian 2025 Spring Symposium**  
San Antonio, Texas  
<https://tdsymposium.com>

**MAY 13-25, 2025**

**New York School Nutrition Innovation Conference**  
Saratoga Springs, New York  
<https://schoolnutrition.org>

**JUNE 2-3, 2025**

**Future Food-Tech Summit**  
Chicago, Illinois  
<https://www.futurefoodtechprotein.com>

**JUNE 5-8, 2025**

**11<sup>th</sup> Annual Health Meets Food: The Culinary Medicine Conference**  
Washington, D.C.  
<https://culinarymedicine.org/conference>

**JUNE 13-13, 2025**

**Ohio School Nutrition Innovation Conference**  
Dublin, Ohio  
<https://schoolnutrition.org>

**JULY 13-15, 2025**

**School Nutrition Association Annual National Conference**  
San Antonio, Texas  
<https://schoolnutrition.org>

**AUGUST 8-11, 2025**

**Association of Diabetes Care & Education Specialists Annual Conference**  
Phoenix, Arizona  
[www.diabeteseducator.org](http://www.diabeteseducator.org)

**OCTOBER 13-17, 2025**

**National School Lunch Week**  
<https://schoolnutrition.org>

**NOVEMBER 4-7, 2025**

**The Obesity Society ObesityWeek 2025**  
Atlanta, Georgia  
<https://obesityweek.org>

**JANUARY 11-13, 2026**

**School Nutrition Association School Nutrition Industry Conference**  
Austin, Texas  
<https://schoolnutrition.org>

**MARCH 8-10, 2026**

**School Nutrition Association Legislative Action Conference**  
Washington, D.C.  
<https://schoolnutrition.org>

**APRIL 8-12, 2026**

**Obesity Medicine 2026**  
San Diego, California  
<https://obesitymedicine.org>

**APRIL 13-17, 2026**

**National CACFP Association 40<sup>th</sup> Annual Child Nutrition Conference**  
Las Vegas, Nevada  
<https://www.cacfp.org>

**APRIL 26-28, 2026**

**Washington State Academy of Nutrition and Dietetics Annual Conference**  
Vancouver, Washington  
<https://eatrightwashington.org>

**JULY 12-14, 2026**

**School Nutrition Association Annual National Conference**  
Charlotte, North Carolina  
<https://schoolnutrition.org>

**OCTOBER 12-16, 2026**

**National School Lunch Week**  
<https://schoolnutrition.org>

**NOVEMBER 14-17, 2026**

**The Obesity Society Obesity Week 2026**  
Washington, D.C.  
<https://obesityweek.org>

**JANUARY 10-12, 2027**

**School Nutrition Association School Nutrition Industry Conference**  
Tampa, Florida  
<https://schoolnutrition.org>

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**TD2502**



# Pork

## Possibilities at Mealtime

Last August, I traveled to Iowa with a group of dietitians for the Pork & Partners Roadshow hosted by the Pork Checkoff. During the trip, we had an opportunity to cook with various cuts of pork, learned about the nutrient profile in today's leaner pork, and attended the Iowa State Fair, where we sampled everything from their famous pork chop on a stick (a perfectly cooked tender and juicy pork chop) to apple fries and sweet corn.

As a dietitian who came to the meeting with questions about pork, including the leanest cuts, simple cooking techniques, and the correct internal cooking temperature for fresh pork, I learned some important facts that I've already put into practice in my home kitchen.

Pork is affordable, nutrient-dense, and a rich source of high-quality protein. It's popular worldwide, versatile, and a nourishing protein option clients can easily include at every meal occasion.

Consider sharing the following pork facts with your clients:

- There are eight lean cuts of pork, including pork tenderloin, sirloin pork chop, New York pork roast, and 96% lean ground pork. (Caveat: 96% lean ground pork may be hard to find at retail, so consumers should ask for it since demand can lead to availability.)
- Pork is ideal as an ingredient in well-balanced, plant-forward recipes. While meat at the center of the plate may be something more familiar to many people, by incorporating pork into recipes like Egg Roll in a Bowl (see below), it can encourage the consumption of more fruits, vegetables, and whole grains.
- A 4 oz serving of pork tenderloin has 29 g of protein and important nutrients, including selenium, B vitamins, and zinc.

In addition, the correct way to cook fresh pork is to an internal temperature of 145°F with a three-minute rest. Here is a quick guideline:

- Medium-rare: 145°F to 150°F;
- Medium: 150°F to 155°F; and
- Medium-well: 155°F to 160°F.

Pork was once marketed by the industry as "the other white meat" due to its many lean cuts, but the slogan caused confusion among consumers. The USDA classifies pork as red meat, so the term "white meat" led some home cooks to believe it needed to be cooked until completely white to be safe. In reality, pork can safely be served with a pink center, which helps retain its moisture and flavor. (Overcooking can lead to dry meat.) ■

Liz Weiss, MS, RDN, is the mom of two grown boys with a specialty in family nutrition and healthy aging. She shares recipes and healthful living advice on [LizsHealthyTable.com](http://LizsHealthyTable.com) and her podcast, **EAT, DRINK, LIVE LONGER**. Weiss is a cooking instructor, speaker, and frequent lifestyle guest on TV shows across the country.

## Egg Roll in a Bowl

### Serves 4

When sharing recipes like this one with clients, encourage them to change things up based on flavor preference, availability of ingredients, and time constraints. For instance, carrots can be purchased preshredded, and rice is available in convenient microwavable pouches, which may be easier than cooking from scratch.

### Ingredients

- 4 tsp sesame oil, divided
  - 1 lb pork tenderloin, cut into  $\frac{3}{4} \times \frac{3}{4}$ -inch pieces
  - $\frac{1}{2}$  tsp ground ginger
  - $\frac{1}{2}$  tsp garlic powder
  - 3 cups broccoli slaw or other coleslaw mix
  - 1 red bell pepper, cut into thin strips
  - 1 large carrot, shredded on the large holes of a box grater (1 cup)
  - $\frac{1}{2}$  tsp kosher salt
  - $\frac{1}{4}$  tsp black pepper
  - $\frac{1}{2}$  cup thinly sliced green onion, divided
  - 2 cups cooked brown rice or cauliflower rice
- Optional Toppings:** Chopped roasted peanuts, roughly chopped cilantro, and spicy sriracha mayo or any other favorite sauce

### Directions

1. Heat 2 tsp of the sesame oil in a large nonstick skillet over medium-low heat. Swirl oil around pan. Add pork, and cook, stirring often, until cooked through and slightly pink inside, 4 to 5 minutes. Remove to shallow bowl and set aside.
2. Raise heat to medium-high. Add remaining 2 tsp sesame oil. Add coleslaw mix, bell pepper, carrot, ginger, garlic, and few pinches salt and pepper. Cook, stirring occasionally, until vegetables are tender, 4 to 5 minutes.
3. Reduce heat to low. Add pork, any juices, and half the green onion back to skillet. Heat until warmed through, 1 minute. Season with salt and pepper to taste.
4. Place brown rice in individual bowls. Spoon pork-cabbage mixture over rice. Garnish with remaining green onions and peanuts, cilantro, and sauce, as desired.

### Recipe Note

Spicy sriracha mayo can be made by whisking together  $\frac{1}{2}$  cup light mayonnaise, 4 tsp sriracha sauce, 2 T lime juice, and kosher salt, to taste.

### Nutrient Analysis per serving: (1 cup pork/veggie mixture and $\frac{1}{2}$ cup rice)

Calories: 330; Total fat: 9.8 g; Sat fat: 2.2 g; Cholesterol: 83 mg; Sodium: 240 mg; Total carbohydrate: 26 g; Dietary fiber: 3.6 g; Protein: 33 g

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