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FROM THE EDITOR

Plant Products Need to Target Flexitarians

If you’re selling a plant-protein product, you might want to make sure that your marketing isn’t so narrow that it leaves out what ultimately is turning out to be the driving force of the plant-based protein market: flexitarians.

Flexitarians are those who alternate between consuming animal and non-animal products, with no exclusivity. Increasingly, it’s flexitarians who are seeking plant-based products. The numbers support this. Plant protein supplier Cargill (Minneapolis) recently shared new data from a market survey commissioned by the company and conducted by Nielsen on nearly 2000 consumers during the second half of 2018.

The survey found that nearly 39% of respondents were actively trying to eat more plant-based foods. The number of flexitarians is undeniably growing. “People are really looking to balance the use of both kinds of proteins and, even increasingly, [looking for] consumer products that are actually combining both sources,” Matthew Jacobs, Cargill’s product line leader for plant proteins, recently told me.

There also may be more flexitarians than market data suggests. For instance, consumers seeking more plant protein may not even originally identify themselves as flexitarians, said Jacobs. “The definition of flexitarian is not really consistently defined,” Jacobs pointed out. Some consumers, for instance, might think they are primarily meat eaters—but if you examine their actual eating behaviors, Jacobs said you’ll actually find that some have been actively incorporating more plant foods in their diets and perhaps not even realizing it.

The bottom line is that the significance of the flexitarian consumer cannot be ignored today. It’s why classic burger chains are adding plant-based options to their menus—most recently, Burger King, who just this April introduced its 0%-meat Impossible Burger.

With flexitarian dominance in mind, said Jacobs, marketing a plant product narrowly to cater only to vegetarians or vegans may be excluding a valuable segment of your market and “alienating a broader consumer base.” Instead of labeling a product as vegan or vegetarian, he said, an alternative is to “try to talk about the fact that the product, for instance, has the same quality and sensory experiences of a meat product and then see how a typical meat eater responds.”

In order to help its clients identify where the greatest opportunity areas are in the plant-based market, Cargill’s new survey analyzed, by product type, where interest in plant-based foods might be highest. Survey respondents were asked to indicate which types of plant-protein products they are open to buying, with the following results: nutritional beverages (70%), snacks (62%), frozen breakfast (61%), frozen meals (60%), and dairy (60%).

I asked Jacobs for his impression about these findings. He surmised that the reason why plant-based beverages rank so high is because “plant proteins tend to perform quite well in that kind of application, whether it’s an alternative to a dairy-based beverage or a dry-blended beverage. The real early successes with the better-tasting plant proteins has been in those kinds of applications, so I think people just have a predisposition to being open to plant proteins in those kinds of applications.”

He also said that the high reception of plant-based frozen meals was surprising. Overall, he said, these scores across the board are “really high.”

“We could have had results that were coming back more in the 20% range,” he added, “so the fact that this is showing a huge openness to a real broad swath of product categories—I think that just paints a fantastic picture for the future of plant proteins.”

Effectively capturing the loyalty of the new flexitarians will of course require that those working in plant protein continually improve the consumer experience with these ingredients—especially, Jacobs said, “the consumer base out there who just is still skeptical, largely for sensory reasons because they may have had some previous experience where a [plant-based product] just did not live up to the expectations.” This means working to exceed taste and texture expectations, something that Jacobs said suppliers are getting better at.

These days, he said, “there is also a lot more emphasis on understanding now what are the other components of that matrix that deliver a really good-eating, good-smelling, good-textured product.”

When formulating for the plant-based market, Jacobs said, the key is remembering that “it’s not necessarily [about] abandoning or replacing it’s more about adding to and providing more options.”

Read the full version of this article at ow.ly/ungw50tl0NJ

Jennifer Grebow
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Amarin Pharma, maker of the omega-3 drug Vascepa, has failed in its attempt to get an investigation launched against certain omega-3 dietary supplement products. On May 1, the United States Court of Appeals for the Federal Circuit upheld a 2017 decision of the International Trade Commission (ITC) not to investigate Amarin’s complaints against companies like omega-3 oils supplier DSM Nutritional Products and omega-3 supplement brands such as Pharmavite LLC and Nordic Naturals Inc. The decision is considered a big win for the omega-3 dietary supplement industry.

In September 2017, Amarin filed a lawsuit with the ITC, requesting that the ITC investigate certain omega-3 dietary supplement companies, alleging that the supplement companies’ omega-3 eicosapentaenoic acid (EPA) fatty acid concentrates, in either ethyl ester or re-esterified form, are synthetic and therefore not considered dietary ingredients and not allowed in dietary supplements according to the Federal Food Drug and Cosmetic Act (FD&C Act). (Amarin’s Vascepa drug comprises 1 g of EPA in ethyl ester form, synthetically produced from fish oil, and is marketed to adults with severe hypertriglyceridemia. It is the only purified ethyl ester EPA sold as an FDA-approved drug.)

Amarin urged the ITC to stop the “unlawful importation or sale in the United States of synthetically produced omega-3 products.” This move was largely seen in the dietary supplement industry as an attempt by the drug company to eliminate competition from the supplement companies. It was not the only time Amarin had gone after omega-3 dietary supplement companies, either. Last year, Amarin filed suit against two omega-3 supplement makers, alleging that the companies used positive results from Amarin’s own REDUCE-IT clinical drug trial to advertise their own supplement products.

Following Amarin’s September 2017 ITC complaint, dietary supplement advocates, such as dietary supplement industry association the Council for Responsible Nutrition (Washington, DC), urged the ITC not to proceed with an investigation.

In October 2017, the U.S. FDA itself also urged ITC not to investigate the case. Namely, the agency said, only FDA can determine whether or not these products are not dietary ingredients and are unapproved new drugs under the FD&C Act, and that private parties are prohibited from bringing such enforcement actions. The agency said it had not reached any conclusion as to whether or not the omega-3 concentrate ingredients in question are dietary ingredients and that any decisions reached by ITC, were ITC to investigate, could contradict an eventual FDA decision.

In October 2017, the ITC ultimately decided not to investigate Amarin’s complaint, citing grounds that FD&C Act determinations are the purview of FDA and also that Amarin’s complaint of false advertising did not hold up under the Lanham Act of 1946, which prohibits trademark infringement and false advertising.

Following ITC’s dismissal of the case, in December 2017, Amarin filed an appeals case with the United States Court of Appeals. Its arguments were heard in June 2018. Ultimately, the news came this May that the company lost this appeal. (One judge dissented.) The court majority wrote that it agreed with ITC’s decision that Amarin had “failed to allege a cognizable claim based on an unfair method of competition or unfair act under 19 U.S.C. § 1337(a)(1)(A).”

Dietary supplement industry leaders celebrated the news. In a statement, CRN’s president and CEO, Steve Mister, said: “CRN welcomes the decision of the U.S. Court of Appeals for the Federal Circuit in Amarin Pharma, Inc. v. ITC, affirming the International Trade Commission’s decision not to investigate Amarin’s complaint that alleged certain types of concentrated omega-3 fish oil products were not dietary ingredients and therefore could not be imported as dietary supplements. This decision is significant and beneficial for the dietary supplement industry as it confirmed FDA’s exclusive jurisdiction to interpret and enforce the provisions of the Food, Drug and Cosmetic Act.”

He continued: “CRN recognized that Amarin was seeking to impose restrictions that could have created a market monopoly for pharmaceutical companies over a subset of omega-3 products, hindered responsible manufacturers from selling beneficial fish oil supplements, and removed consumers’ abilities to buy affordable products that benefit their health and well-being. We continue to be committed to fight for our member companies in this space and for proper jurisdiction of FDA.”

The Amarin case yields discussion of how drug and supplement companies sometimes suffer an adversarial relationship but other times do not. Nutritional Outlook covered the topic in the feature story of our recent April 2019 issue.
We help our customers formulate with challenging ingredients by connecting them with the experts in taste enhancement and modulation: our dedicated flavorists and food scientists. With a direct line to these collaborators, you get individualized and immediate attention from the people who deliver preferred taste every day.
It’s probably a sign of the strange times we’re in that one of the hottest diet trends to hit supermarkets and social media in years looks not to the future for nutritional solutions, but suggests that we…go back to eating like cavemen.

Yet that’s just what the paleo diet—so-named in a nod to our Paleolithic ancestors—asks its adherents to do. And they’re apparently falling in line, for category analysis from the market research firm SPINS (Chicago) indicates that the $497.6 million market for paleo-positioned products is growing at double-digit rates in all channels the firm follows.

But like the cavemen who inspired the diet, will paleo eventually go extinct? And if it does, will it leave a lasting impact on food and beverage development—to say nothing of how people actually eat—before it goes?

As far as Douglas Smith, co-founder, Paleo Pro Protein Powder and True Nutrition (Vista, CA), is concerned, that would be a fitting legacy. “I really hope the public doesn’t view paleo as a ‘thing’ or something that’s here today, gone tomorrow,” he says. “The idea is to change to this style of eating forever.”

Make Americans Cavemen Again

It’s safe to say that no small contingent of health and nutrition professionals would have a bone to pick with Smith’s idea. For the principles underlying the paleo diet are not without controversy.

Those principles first gained traction—with modern humans, at least—as early as the 1970s. But it wasn’t until the 2002 publication of Loren Cordain’s The Paleo Diet that the eating pattern really caught fire.

That eating pattern rests on the belief that our bodies have yet to evolve to accommodate the foods that agriculture and industrialization have brought. The upshot of this metabolic mismatch, adherents say, has been an epidemic of “diseases of excess” like type 2 diabetes, heart disease, and chronic obesity.

By returning to the more pro-adaptive diets of...
our Paleolithic ancestors, the thinking goes, we’d head off those diseases at the pass.

So permitted within the diet’s pantry are foods like grass-fed meats, fish and seafood, fruit, vegetables, eggs, nuts, and seeds—foods our hunter-gatherer forebears would have, well, hunted or gathered. By contrast, cereal grains and legumes produced through cultivation, dairy products, potatoes, refined sugar, salt, refined vegetable oils, and processed foods more generally are verboten.

“How we see it is that at its core, the paleo diet is the consumption of happy animals and happy plants,” Smith explains—“basically, the foods you’d find before grocery stores were around.”

Beyond that, the “rules” can bend to fit the contemporary caveman’s needs. “Finding what works best for each individual is usually the best step,” Smith advises. “Also, removing foods that reside in the middle sections of the grocery store—the elimination of sugars, grains, lecithin-containing plants, vegetable oils, and essentially anything packaged, boxed, or bagged—is the premise.”

Gathering Mainstream Steam

In a world where convenience commands a premium, selling stretched shoppers on a diet that shuns convenience foods sounds like an uphill battle. But consumers are buying paleo, at least in its broad outlines.

And not just food faddists, either. The SPINS data, which covered natural, specialty gourmet, and conventional multi-outlet retail sales through the 52 weeks ending February 24, 2019, found the fastest paleo growth in the conventional multi-outlet space.

“While the lion’s share of paleo-positioned products are still natural-positioned, conventionally positioned products saw triple-digit growth at a rate of 352.9% over the past year,” notes Michelle Gillespie, NTP, a natural insights analyst with SPINS.

And the reason why, Smith contends, is simple. “The paleo ‘diet’ caught on because it flat-out works,” he says. “If it’s mainstream now, we feel that’s not because it’s a fad, but because
it’s how humans should eat. If the public at large moved toward a more paleo-style diet, the metabolic health issues we currently face would dramatically go away."

How Humans Should Eat?
And that’s where some professional pushback might rear its head.

For despite there being a seductive appeal to the diet’s evolutionary-biological certainty, “[T]he paleo diet concept has been widely criticized for lacking a solid scientific foundation,” notes “Fads in Focus: The ‘Paleo’ Diet,” a May 2016 Euromonitor International opinion paper.

Further, what makes us think that our hunter-gatherer predecessors were so much healthier than we are in the first place? Do we even know what they ate—and in what regions and under what circumstances? And were they even eating that much at all, given the likelihood of periodic famines?

The diet’s tenets also contravene the 2015-2020 Dietary Guidelines for Americans, which explicitly include within their definition of a “healthy diet pattern” paleo-prohibited ingredients like grains—half of which should be whole—pulses, and dairy.

Paying Diverse Dividends
So whether dieting caveman-style really puts us on a path to better health remains debatable. But perhaps paleo followers can tolerate a degree of nutritional dubiousness because the diet pays dividends in a completely different currency that they also value.

For example, notes Gillespie, “Paleo enthusiasts value foods farmed using organic or biodynamic practices, eating in a way they perceive is closer to nature.”

Don’t discount the diet’s fit with a range of contemporary lifestyles, either. “With the widespread popularity of paleo, there are core dieters who span age groups and walks of life,” Gillespie points out. “As the diet moves mainstream, the base of consumers interested in it has grown to encompass everyone from those looking to lose weight to fitness enthusiasts.”

And that helps explain how its influence has spread. A case in point is the keto diet, which Smith thinks has profited from paleo’s popularity. “The ketogenic diet has been around for decades, but it’s begun to really pick up steam,” he claims. Because paleo eating so tightly restricts carb consumption, it "allows the body to start producing ketones from fat and is a really good fit to a ketogenic metabolism.”

A Boon to Bags and Boxes
Given paleo’s celebration of fresh fruits and vegetables, you’d think that the diet’s rising tide would lift produce’s boat, too. But you’d be wrong. According to Euromonitor data published contemporaneously with “Fads in Focus,” fresh vegetable sales in the three markets with the greatest paleo penetration—the U.S., Australia, and the UK—fell, while fresh fruit sales fell in the UK and remained static in the U.S. and Australia.

Indeed, it’s an inescapable irony that the supermarket section best poised to benefit from paleo power may carry the very processed products that the diet so vehemently purports to spurn. Yet the food industry sees the writing on the wall and is fast at work launching new products that, if not paleo per se, are at least “paleo-inspired.”

Consider the 2015 launch in Australia of three new offerings in the free-range meat company Cleaver’s “Paleo Range”: Organic Honey Beef Chipolatas, Chilli Pork Sausages, and Organic Tomato Beef Burgers. As if to leave no doubt that the products are...
paleo-positioned. “The range’s packaging is graced by a drawing of a spear-wielding cave-man,” Euromonitor notes in “Fads in Focus.”

The meat snack movement can also credit paleo for its growing patronage. Euromonitor points to U.S.-based The New Primal as capitalizing on the trend with its Primal Spicy Grass-Fed Beef Jerky and Primal Turkey sticks, the latter made with free-range turkey raised without hormones or antibiotics.

Smith agrees that paleo’s shine has rubbed off on meat-eating. “We seeing much more extreme versions of the paleo diet, like the carnivore diet, which is, essentially, the consumption of meat nose to tail and some animal products—eggs, milk, butter, etc.” he says. Though it’s about as popular with nutritionists as paleo itself, “It’s picked up quite a bit of energy in the media of late.”

The grain-free trend is another beneficiary of paleo’s success. “While not always low-carb, grain-free products are often higher in protein and lower in refined carbohydrates, giving them appeal to mainstream consumers who may be interested in weight loss,” Gillespie notes. “And products like low-carb cauliflower-crust pizzas entering the mainstream market—even if not entirely grain-free—speak to the influence of paleo on the larger market.”

Some grain-free products are even making paleo palatable. New York City-based Hu Kitchen makes a Get Back to Human Almond Butter + Puffed Quinoa Chocolate Bar that’s both vegan and “primal,” according to the Euromonitor report. And for those wondering how quinoa made it into a “primal” product, it got a pass by qualifying as a seed, not a cereal.

**Backlash Brewing**

Chocolate bars with almond butter and puffed quinoa probably weren’t what paleo’s progenitors had in mind—either during the Paleolithic era or twenty years ago. And proponents like Smith have mixed emotions about where the eating pattern is headed.

“The fortunate and unfortunate fact is that it’s 2019 and producers are creating products that fit within the paleo lifestyle,” he says. “Fortunate because people are catching on, he says; unfortunate in that “many products out there are simply placing a ‘paleo-approved’ sticker on the packaging even though there’s nothing paleo about the product.”

So in another irony for the paleo trend, the backlash to the diet’s success may come from where you’d least expect it: its true believers. “The truth is, I kind of cringe when I hear the term ‘paleo diet,’” Smith admits. “In reality, it should just be the human diet. I’m not sure when we decided that what had been the core human diet for millions of years qualified as a fad, but to consider eating healthy, happy animals and plants a ‘new thing’ is a shame, and somewhat silly.”

Kimberly J. Decker writes for the food and nutrition industries from her base in the San Francisco area, where she enjoys eating food as much as she does writing about it.

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Not long ago, the words organic and botanically based applied mainly to things we ate—or, like supplements, swallowed in pill or powder form. But lately, says Ramon Luna, marketing coordinator, Ecuadorian Rainforest (Clifton, NJ), “Store shelves are lined with more than just natural foods and supplements. There are natural cleansers, shampoos, body-care products, and more.”

And it makes sense: Given the inordinate energy we spend vetting what goes into our bodies, shouldn’t we devote the same scrutiny to what goes onto them—skin, hair, and nails—as well?

So with consumers “shopping more scrupulously,” as Luna puts it—even for ostensibly surface-level lotions and potions—“they’re more aware of what they use on their bodies, and they’re realizing that instead of using chemicals, they can rely on natural products to get the look they desire.”

The upshot: These are boom times for botanical beauty and plant-based personal care. And as suppliers refine their crop of botanical ingredients, the benefits both to consumers and to brands promise only to grow.

**Better Botanicals**

“Natural, sustainable, and plant-based beauty is taking a major stake hold in the market today,” declares Paula Simpson, nutricosmetics formulator and founder, Nutribloom Consulting (New York and Toronto; www.paulasimpson.com). “Plant-based and botanical ingredients are a natural fit within this category.”

Of course, botanical ingredients have been standard in personal care since before it was even a category. So if you thought those green bottles of Clairol Herbal Essence were a throwback, consider that “we’ve relied on plants and botanicals for thousands of years to promote health and vitality, manage chronic conditions, and contribute to skin and beauty regimens,” Simpson says.

The difference is that science is finally catching up to the folklore, elucidating how whole-plant or isolated phytochemical actives work “either systemically or topically for natural beauty,” Simpson continues. “From large classed groups like carotenoids and polyphenols—with their effects on oxidative stress, inflammation, epigenetics, or even the microbiome—to isolated actives that target a specific mechanism of action, botanicals offer a multitude of benefits and a variety of claims that both nutricosmetic and natural skincare products can capture.”

**Not Just Cosmetic**

Even better, contemporary extraction and processing methods are improving ingredient quality, stability, and effectiveness, while granting consumers the transparency they prize. That’s giving botanical beauty
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People want higher energy levels, as well as greater endurance and physical strength to stay healthy and fit. While healthy habits like a good diet and exercise are essential, a well designed functional beverage can help boost energy, improve workouts, and aid in post exercise recovery. In Traditional Chinese Medicine, Qi tonic herbs are used to increase energy output. Yin tonics nourish and restore cell and tissue growth, while yang tonics promote energy, nervous system activity, and sex hormones. A well designed formula achieves an optimal yin/yang balance. Eleuthero is used to promote physical energy and endurance, and boost immune function, mental energy, and stress resistance. Rehmannia is a powerful restorative yin tonic for improving blood and bone marrow health, adrenal health, stress, and strength. Beets have beneficial effects on circulation and endurance by increasing nitric oxide, and are rich in nitrates, antioxidants, and amino acids like betaine.

Toxins from air, water, and food pollution can lead to poor health and serious illness. Common symptoms of high toxicity are fatigue, fuzzy concentration, skin blemishes, and pain. Toxins can also cause more serious problems, such as increased risk of cancer, cardiovascular disease, and autoimmune diseases; impaired cognition; and lung issues like bronchitis and asthma. Natural botanicals for your beverage products can help detoxify the lungs, skin, and body from pollutants; increase excretion of heavy metals; help the liver metabolize toxins; and provide cell-protecting antioxidants. Burdock root is a blood detoxifier that promotes bile flow, lymph drainage, and sweating, helping clear skin blemishes and boost joint health. Milk Thistle seed supports a healthy liver and its regenerative capacity, aiding its ability to detoxify harmful substances. As a potent antioxidant, it protects the liver from damage due to toxins. Schisandra helps protect the liver from toxic environmental compounds.

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Immunity
A healthy immune system protects the whole body against the viruses, mold, and bacteria that surround us. The immune system can be weakened by a host of factors including poor diet, aging, lack of sound sleep, emotional/stressful events, and environmental toxins. When the immune system is compromised, acute infections can lead to life threatening situations. Chronic infections can result in disability or auto-immune diseases like lupus or rheumatoid arthritis, and cell mutations resulting in cancerous conditions can gain a foothold.

Reishi mushroom is an adaptogenic tonic that can boost energy and vigor, while also promoting sleep and relaxation. It is rich in polysaccharides that help stimulate the immune system to combat viruses, retroviruses, fungal infections, and allergies.

Turkey Tail mushroom has anti-microbial effects to fight upper respiratory, urinary, and digestive conditions. It supports lung function and increases qi.

Shiitake mushroom increases T cells and natural killer cells, and its Lentinan component stimulates production of antiviral immunoglobulins, helpful for allergies, flu, colds, and fungal infections.

Adaptogens & Stress Support
Adaptogens help restore the body’s physiological systems that are thrown off-kilter by stress to bring them back into balance. These herbal tonics influence the immune system, nervous system and brain, liver, adrenal glands, and endocrine system. As tonics, adaptogens can be used for a longer period of time to heal the body and combat stress. Too much stress causes a spike in cortisol which can eventually lead to thinning of the skin, muscle and bone loss, and increased fat storage. Cortisol can accelerate aging by raising blood sugar, leading to increased tissue glycation, followed by inflammation and tissue damage.

Albizzia julibrissin is used in TCM for calming the spirit and easing restlessness, irritability, stress, and insomnia. It also helps with memory and focus. Reishi mushroom has tranquilizing effects and is used for restlessness and insomnia. Studies show Reishi boosts the immune system and energy levels, and promotes deeper sleep. Rhodiola increases physical endurance, reduces fatigue, improves mood, and boosts libido.
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As Shaheen Majeed, president worldwide, Sabinsa (East Windsor, NJ), puts it, “Though botanical ingredients have been included in modern beauty products for years, they were present mostly in small amounts as ‘claim’ ingredients—people liked that the botanicals were there, so the ingredients helped sell the product.”

Now “there’s been a shift toward using botanicals as performance ingredients because they deliver benefits,” Majeed continues. “This advance happened as technology evolved to process them into stronger actives and to measure performance, thereby demonstrating benefits.”

Contemporary purification and standardization methods for natural ingredients also ensure performance consistency, too, Majeed adds, “which is important with a botanical that can vary from season to season.”

"Natural, sustainable, and plant-based beauty is taking a major stake hold in the market today,” says Paula Simpson.

Work It
We also better understand how botanical ingredients act on skin, hair, and nails—enabling brands to fine-tune formulations to target benefits.

In most cases, says Brien Quirk, director of R&D, Draco Natural Products (San Jose, CA), a botanical’s mechanism of action produces “a physical effect, such as moisturizing or enhancing the skin’s barrier function. But at a deeper level, the bioactive phyto-compounds exert effects on cell signaling and at the genetic level to modify inflammation, protein synthesis, cell growth and division—rejuvenation—and, ultimately, cell longevity.”

Majeed adds that some nutricosmetic beauty botanicals help inhibit formation of advanced glycation end products (AGEs), which research implicates in exacerbating myriad age-related ills, including those that weaken skin. Meanwhile, other ingredients stanch free-radical and singlet-oxygen-induced lipid peroxidation and prevent the fragmentation and degradation of collagen and elastin fibers.

Applied topically, Majeed says, “Botanical extracts can even skin tone and provide anti-aging properties by inhibiting tyrosinase enzyme and melanin production”—responsible for darkening skin—and can protect cells from harmful UV radiation, act as antioxidants, improve hydration, and promote synthesis of fibrous proteins in the dermis.”

Inside or Out?
So are consumers better off ingesting beauty botanicals, or letting them work from the outside in?

“Beauty ingredients applied topically show more immediate effects compared to ingestion, which is more subtle and takes time,” Majeed says. “The activities are different. Oral ingredients are taken in milligrams, whereas for topical application they’re used in percentage levels.”

Ultimately, given that visible signs of aging like wrinkles and sagging skin result from both extrinsic and intrinsic factors, Majeed recommends a tag-team approach of topical application and ingestion to supply the optimum “synergistic potential compared to using either alone.”

And what’s next for botanical beauty? “Late-ly we’ve seen requests for multi-botanical formulas that deliver more therapeutic aspects, addressing such conditions as itchy scalp, hair loss, and antioxidant skin protection,” Quirk says. “Antiaging seems still to be trending strongly—probably never will let up—and moisturizing is always essential.”

Whatever perks consumers seek, they’ll likely keep looking for them in the garden. As Majeed says, “People like naturally derived ingredients, and they also like products that work. With today’s botanicals, they can have both.”

Read on to see which beauty botanicals experts think are sitting pretty.

Fruit-Derived Polysaccharides
Those of us who get our five-a-day of fruit know how good apples, peaches, pears, and the like are for our insides. But Quirk points to “exciting developments with fruit-derived polysaccharides” that hint at benefits for our outsides, too.

“We know that fruit extracts, such as apple, pineapple, peach, apricot, jujube, and goji berry, have high levels of pectin-based polysaccharides that are good at locking in moisture because of their enormous, complex honeycomb molecular structure,” he explains. These compounds are water-based and leave no oily sheen, and can replace synthetics like carboxymethylcellulose and carbomer, too, he adds. “Another good example is from Japanese Elm bark, which has been compared to hyaluronic acid in terms of efficacy.”

The catch: To ensure peak efficacy, water extraction of fruit-derived polysaccharides is best, Quirk says; products made via ethanolic extraction exhibit poor solubility and polysaccharide content.
Cannabidiol (CBD)
According to Quirk, the domestic market for botanical beauty still tilts toward topicals—particularly in the absence of sufficient clinical support to breed full consumer confidence in ingestible “beauty-from-within.”

But cannabidiol (CBD), the non-psychoactive cannabinoid found in hemp and marijuana, offers a case study in how botanical beauty ingredients can “code-switch,” so to speak.

“Even though topical use of CBD is mainly marketed for transdermal absorption into systemic circulation for pain relief and calming actions,” Quirk says, “there are growing uses for local topical benefits, like reducing acne inflammation and addressing other inflammatory skin conditions, such as psoriasis and possibly general skin inflammation.”

Brands can also pair CBD with agonists—like those derived from black pepper, clove, and cinnamon essential oils—to support cannabinoid receptors and enhance CBD absorption and activity, Quirk says.

Pterocarpus marsupium
What does insulin response have to do with aging skin? More than you might think.

When the body’s ability to release insulin following a blood-sugar spike flags, levels of circulating sugars remain high. “Increased sugar levels bind to proteins by the process of glycation,” Majeed explains, “and produce AGEs, which in turn damage collagen and elastin.”

Pterostilbene—a stilbenoid compound related to resveratrol and found in the Indian kino tree (Pterocarpus marsupium)—has been shown to effectively control blood-sugar levels by inducing the pancreas’s beta cells to release insulin. That means fewer building blocks for age-promoting AGEs.

Sabinsa’s branded ingredient Silbinol is sourced from Indian kino and standardized to contain a minimum of 90% pterostilbene.

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**Andrographis paniculata**
Practitioners of both Chinese and Ayurvedic medicine have turned to the South and Southeast Asian herb *Andrographis paniculata* for centuries, prizing its antibacterial, antifungal, even its adaptogenic benefits. Now, Draco’s Quirk calls attention to its “most pronounced and unique antiaging effects, with evidence of a clinically proven mechanism of action.”

To wit, topical application of the extract appeared in a study to increase epidermal stem cell proliferation and boost type-1 collagen production in normal human fibroblasts. The researchers found that eight weeks of treatment improved skin hydration, dermal density, wrinkling, and sagging, leading them to suggest *A. paniculata* “as a possible antiaging agent.”

**Artocarpus lacucha**
What could possibly be better than resveratrol, the polyphenol credited with everything from the “French Paradox” to fighting oxidation? If the research is to be believed, the answer may be its cousin oxyresveratrol, derived from the dried heartwood of the monkey fruit tree (*Artocarpus lacucha*).

One study found the compound to be 150 times stronger than resveratrol—and 32 times stronger than kojic acid—in its ability to lighten skin and potentially even out skin tone, Majeed says. Another reinforced the compound’s superior antioxidant activity, inhibition of the tyrosinase enzyme, and capacity to protect against UV radiation. “It’s also known to reduce the formation of AGEs and the crosslinking of collagen,” Majeed adds. Sold as Artonox, Sabinsa’s *A. lacucha* product contains a minimum of 95% oxyresveratrol.

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*Botanical science is finally catching up, showing how whole-plant or phytochemical actives work, says Paula Simpson.*

**Andrographis paniculata**

*Pterocarpus marsupium*

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Curcuma longa

Botanicals are remarkably rich sources of compounds that inhibit the melanin-synthesizing enzyme tyrosinase—making them key ingredients in formulations that aim to lighten skin tone. A fitting example comes from turmeric root (*Curcuma longa*), which is the source of the tetrahydrocurcumin used in Sabinsa’s trademarked SabiWhite ingredient.

Majeed says the active inhibits tyrosinase powerfully enough to slow melanogenesis and is more effective than kojic acid, licorice root extract, and vitamin C as a natural depigmenting agent.

But don’t just take his word for it: a randomized, double-blind, placebo-controlled study involving 50 human subjects found a 0.25% cream preparation of the ingredient to be a safe and effective alternative to a standard 4% hydroquinone cream for topical depigmenting.⁶

Croton lechleri

Don’t let the name put you off; dragon’s blood is the common term for a resin oil extracted from *Croton lechleri*, a native South American tree, and it’s getting attention for its potential as a beauty ingredient.

With flavonoids its main class of actives, the extract’s benefits appear to run mainly to improved circulation, anti-inflammation and oxidative defense—all of which contribute to healthier skin.

“Dragon’s blood may also help soothe skin,” adds Ecuadorian Rainforest’s Luna, although the scientific evidence for its precise effects and mechanism of action is still cooking. Meantime, “It can be found in many antiaging products such as creams, eye-care products and facial sculpting gels,” he says.

Konjac

Ceramide beauty products are a popular and effective segment of the nutricosmetic and cosmeceutical markets. Ceramides are the major lipid constituents of the skin’s outer layer, or stratum corneum. Using a brick-and-mortar metaphor, ceramides act as the “mortar” that helps keep skin cells together—and, as such, they play a key role in maintaining...
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the skin’s barrier and structure and keeping the skin moist and supple.

Unfortunately, aging, along with environmental stressors, significantly depletes the skin’s ceramide production and content over time, particularly in the skin’s outer layer, leading to dryer, rougher skin. By boosting ceramide levels either through supplemental topical or ingestible product application, consumers can see improvements in skin moisture and a reduction in the appearance of fine lines and wrinkles.

Interest in plant sources of ceramides continues to grow in the market. At April’s SupplySide East trade show, Vidya Herbs (Fullerton, CA) highlighted its new ceramide ingredient derived from the konjac plant (Amorphophallus konjac) for the nutraceutical market. The ingredient, whose trade name is Skin-Cera, is equipped with a U.S. patent covering compositions and methods of use. (U.S. patent number US10004679.) Konjac is one plant known to be a rich source of glucosylceramides, which are a ceramide precursor. (Skin-Cera is standardized to 10% glucosylceramides.)

According to Vidya Herbs, a recently conducted, six-week, 51-subject, randomized, single-blind, placebo-controlled clinical study showed that oral supplementation with Skin-Cera, at 100 mg daily, compared to placebo, resulted in significant skin-health benefits, including improvements in dryness, white/blackheads, hyperpigmentation, redness, lesions, itching, oiliness, and roughness. The company’s patent describes the ingredient as being suited for a wide range of delivery formats, including pills, gummies, powders, lotions, ointments, and creams, as well as food and drink.

Kimberly J. Decker writes for the food and nutrition industries from her base in the San Francisco area, where she enjoys eating food as much as she does writing about it.

**References**

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So it makes sense that collagen may be one of the most important ingredients to include in beauty formulations, topical or ingested.

But getting U.S. consumers to see the beauty, so to speak, in collagen won’t happen overnight, as the perception persists that collagen is mainly a joint- and bone-boosting ingredient. Only with a focus on science, efficacy, and innovative delivery—and perhaps with a reputational lift from Asia’s trending nutricosmetic scene—can we effectively push collagen more firmly into our own beauty mainstream.

**Under the Skin**

There are plenty of reasons to be bullish on collagen. As Frank Engel, global market development manager for Peptan, Rousselot (Mukwonago, WI), puts it, “Collagen is the leading driver for innovative beauty products due to its long, established reputation on the global nutricosmetics market”—a market, he adds, that’s set to rake in an estimated $7.5 billion by 2024.

And collagen’s nutricosmetic reputation is hardly a matter of hype, for not only is it one of the most ubiquitous proteins in the body; it’s a fundamental component of skin’s very architecture.

Fully 70% of skin’s dry mass is collagen, which—along with the glycosaminoglycan hyaluronic acid (HA) and the protein elastin—form a network that keeps skin elastic and hydrated. As Susan M. Piergeorge, MS, RDN, LDN, a nutritionist for NeoCell (Irvine, CA), says, “You can think of collagen as a type of internal mesh of strands sewn together within your tissues and organs that provide structural support.”

Of collagen’s more than two dozen “types”—categorized by their size, function, and amino acid makeup—type I, and to a lesser extent type III, appear to participate most in maintaining skin’s health...
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Beauty

“The skin cells known as fibroblasts responsible for collagen production become less active,” says Frank Engel.

and appearance. Indeed, Engel notes, type I collagen accounts for three-quarters of our bodies’ dermal structure.

But beginning in one’s twenties, Engel continues, “The skin cells known as fibroblasts that are responsible for collagen production become less active.” Further, crosslinking of collagen fibers, often in response to oxidative assault or exposure to compounds known as advanced glycation end products (AGEs), renders the fibers stiff and less functional. The upshot, says Engel, is that the collagen matrix “progressively disintegrates, leaving the skin dehydrated, thinner, and prone to wrinkles.”

Short and Sweet

While some degree of collagen deterioration is inevitable, it by no means need be unstoppable, as the track record for collagen supplementation bears out—or, more accurately, as the track record for supplementation with collagen peptides—the short, highly digestible, bioactive byproducts of collagen hydrolysis—bears out.

Collagen peptides send specific signaling messages to connective tissue cells, Engel explains, and “one of those messaging functions sends a false signal to the body that collagen degradation has occurred, activating the synthesis and reorganization of new collagen fibers.” Production of HA and elastin also upregulate in response to these signals. A clinical study awaiting publication found that daily consumption of Rousselot’s branded Peptan collagen peptides increased dermal collagen density, reduced perioral and periocular wrinkling, strengthened hair, and made pores less visible.2

From the Inside Out

It’s no accident that the study obtained its results via oral supplementation, for despite the prevalence of topically applied collagen products, “recent scientific evidence confirms that the highest efficacy comes when collagen is ingested orally,” says Heather Arment, marketing coordinator, North America, Gelita (Sergeant Bluff, IA).

Not currently the Western norm, oral supplementation with nutricosmetic collagen is de rigueur in Asia, and one could argue that supplementation’s effectiveness has made collagen a trusted ingredient in that part of the world.

“In Japan and China, collagen is widely popular and has long been praised for its rejuvenating and antiaging properties,” Engel notes. And though collagen’s standing in the U.S. still rests on its sports nutrition benefits, “that perception is starting to shift and consumers are becoming more aware of collagen’s beauty-from-within properties,” he says.

Crowding Shelves

Arment agrees. “Although Japan leads the way in the field of beauty care and foods containing collagen, this trend is spreading quickly in the U.S. and Europe, as evidenced by the staggering upward
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growth of U.S. collagen-based beverages, foods, and supplements,” she says.

Engel’s noticed the same uptick, and he thinks it makes sense, as such products “offer on-the-go and portable solutions for consumers leading hectic lifestyles and looking for maximum convenience to maintain their skin.” He’s seen his company’s own peptides appear in everything from bone broths and on-the-go soups to low-carb bread-in-a-mug, breakfast smoothies—even collagen waters and dark chocolates.

Piergeorge also points to collagen waters, as well as creamers and gummies, as products that “stand out, as they provide new use occasions for consumers to take collagen on the go and personalize their beauty routines even further.” To make that possible, her company supplies collagen types I and III in powdered, gummy, and chew form, as well as in tablets and liquids that combine the peptides with antioxidant vitamin C.

That collagen can show up in such a panoply of applications testifies to its practicality. Notes Paula Simpson, nutricosmetics formulator and founder, Nutribloom Consulting (New York and Toronto; www.paulasimpson.com), “Collagen is a versatile and stable ingredient that can be formulated into various product forms, added to beverages and water, and even cooked with to reap its health and beauty benefits.” Its neutral sensory characteristics, ease of use, and noticeable results when taken regularly, she believes, have helped it “succeed as a go-to ingredient for both manufacturers and consumers.”

Prestige Protein
Collagen also enjoys some cachet as a prestige ingredient thanks to its frequent appearance in posh “K-” and “J-beauty” products from Korea and Japan. Piggybacking on that renown, Piergeorge says, “Many other beauty brands are including it in a variety of different forms that help enhance beauty and skincare routines.”

Engel wagers that nutricosmetic companies can grow the category even further—and further boost collagen’s image—by “looking to expand their portfolio through cobranding with well-respected, established collagen brands.”

Douglas Jones, global sales and marketing manager, BioCell Technology (Irvine, CA), agrees. “We’ve really seen the rise of branded ingredients,” he says. And for good reason. “The value a branded ingredient brings to the formulator, marketer, and, ultimately, the consumer is supply-chain visibility: you know where your ingredient is coming from. And in our case, you not only know where it’s coming from, but you also know the clinical trials and the benefits you can expect. It’s typical that premium products are those with ingredients that have the science behind them.”

Piergeorge suggests beauty brands leverage collagen science “to create premium collagen products with other beauty-enhancing ingredient blends that address prevailing beauty concerns. Beauty brands should then educate consumers on the benefit of collagen and drive awareness through marketing efforts.”

Regardless of branding or positioning, Simpson concludes, “We know collagen works. Depending on the form or source used, any supportive ingredients, marketing claims, research backing—all these factors will determine the ‘prestige’ of the product in the market. And I think collagen will be here for a long time within the healthy-aging and beauty categories.”

Kimberly J. Decker writes for the food and nutrition industries from her base in the San Francisco area, where she enjoys eating food as much as she does writing about it.

References
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The antioxidant market is rapidly growing, and this growth is driving important changes in the way antioxidant ingredients are formulated and marketed. Lower manufacturing costs and higher consumer demand for natural products are expected to ultimately drive the global antioxidant supplement market to a USD $4.5 billion valuation by 2022, up from USD $2.9 billion in 2015, per Allied Market Research. As this market growth opens up new opportunities for antioxidant brands and manufacturers, expect consumer needs and ingredient research to influence how brands will successfully develop and market antioxidant supplements. Here are just some of the ways that the antioxidant market—and antioxidants themselves—are evolving.

Resveratrol Performs Unique Functions among Antioxidants

David Tetzlaf, senior marketing manager at Evolva (Reinach, Switzerland), says that resveratrol is unique among antioxidants in that it targets a number of proteins and has mechanisms of action beyond just preventing oxidation. Tetzlaf points to recent studies that confirm resveratrol’s role in activating mitochondrial biogenesis and increasing bone density. Evolva’s Veri-te resveratrol ingredient, he says, is ideally positioned to meet consumer demand for antioxidant ingredients that also have a broader impact.

Says Tetzlaf: “Preclinical and clinical studies have documented a number of direct protein activity improvements. Resveratrol targets SIRT1 (sirtuin 1) and AMPK (adenosine 5’ monophosphate-activated protein kinase), for example, which are both important factors in healthy aging. AMPK is also one of the main gatekeepers involved in cellular glucose uptake. Other studies emphasize further protein interactions such as activation of nitric oxide synthase. These additional functions make resveratrol a unique ingredient in a crowded field of other antioxidants.”

Researchers are still unraveling the many ways that resveratrol affects human health. At an event called the Resveratrol 2018 conference in Xi’an, China, it was announced that resveratrol has vasoactive properties that can stimulate cerebrovascular function and reduce the perception of pain. Tetzlaf says that resveratrol may also have bearings on gut health and oral health, as it exhibits...
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selective antibacterial properties that make it desirable for such targeted applications.

Tetzlaf says that while consumer awareness of antioxidants is high, the broad array of products on the market can be confusing. He notes that the affluent baby boomer market in particular is looking for more specific solutions around the wellness concerns that matter most to them, and are searching for clinical evidence to back up product claims.

Shaheen Majeed, president, worldwide, of Sabinsa (East Windsor, NJ), says that resveratrol may hold promise as an exercise supplement due to its antioxidant properties. He cites the results of a Sabinsa-sponsored study involving Sabinsa’s branded resveratrol ingredient, Resvenox. The study, a double-blind, placebo-controlled clinical trial, followed 16 healthy young adults for four weeks and tracked their mitochondrial performance during low-intensity exercise. Participants received either 1000 mg of Resvenox and 20 mg of BioPerine brand piperine (n=8), or a matching placebo (n=8), daily for the duration of the trial. Participants completed three sessions of submaximal endurance training per week, focusing on the wrist flexor muscles in the participants’ non-dominant arms. Participants’ dominant arms were used as a control for the training effect.

The study authors tracked mitochondrial capacity using near-infrared spectroscopy and found statistically significant differences in mitochondrial capacity between the resveratrol/piperine group and the control group. The resveratrol/piperine group saw a 40% increase in mitochondrial capacity, relative to a 10% increase in the control group. Neither group exhibited changes in mitochondrial capacity in the untrained arm.

While consumers are already quite familiar with antioxidants in their traditional applications, Majeed says that increased clinical substantiation is motivating further market diversification. "Antioxidants neutralize free radicals and prevent damage to cells. But recent research suggests that antioxidants may have more profound and specific effects on the body than was previously thought, playing a significant role in aging, immune support, eye health, joint support, and blood sugar support. Because of this increased understanding, antioxidant supplements are more personalized and targeted than ever before."

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"Antioxidant supplements are more personalized and targeted than ever before," says Sabinsa’s Shaheen Majeed.
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Lycopene Gains More Validation as a Skin Health Supplement

Antioxidants in general are seeing broad acceptance in the mainstream and alternative health and wellness communities. Golan Raz, head of the global health division at Lycored (Secaucus, NJ), says that antioxidants enjoy an important benefit: Simplicity.

"Consumers feel knowledgeable enough about antioxidants to add these ingredients to their diets," Raz says. "We're also seeing an interesting expansion in the kinds of delivery systems being used, with bars and beverages often utilized as delivery platforms."

Lycored recently reported the results of a newly published clinical trial examining the efficacy of Lycoderm, Lycored's carotenoid-rich tomato nutrient complex with rosemary extract. The study found that supplementation with the nutricosmetic Lycoderm supported skin's resilience to UV rays. The randomized, double-blind, placebo-controlled multicenter study included 149 healthy volunteers who were randomly assigned to take either Lycoderm or placebo for 12 weeks, followed by a five-week washout phase. Results showed that supplementation with the tomato nutrient complex significantly protected subjects against UVB-induced erythema formation compared to placebo. It also protected against UVB-induced upregulation of interleukin-6 and tumor necrosis factor-alpha when compared to placebo.

Consumers Turn to Lutein for Antiaging, Cognitive Health

An aging baby boomer population and a growing knowledge economy workforce have created demand for supplements that preserve cognitive health and general vitality. Ceci Snyder, global vision product manager for Kemin (Des Moines, IA), says that lutein's role as an antioxidant makes it ideal for branding and positioning in these verticals.

"Consumers are becoming more engaged and motivated to improve their health," Snyder says. "An aging population of baby boomers eager to stay active, younger Americans looking for healthier dietary choices, and a growing knowledge of how antioxidants work are all driving growth in antioxidants."

Snyder also notes that cognitive health is a growing area of consumer interest for antioxidants. Consumers are looking for brain health supplements with a proven track record, and high-quality clinical trials will give consumers confidence that they're opting for supplements that work.

For instance, "Cognitive health is an exciting area of new research with [Kemin's branded] FloraGLO lutein," Snyder says.
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“In one randomized, double-blind, placebo-controlled clinical trial, increased macular pigment optical density was found to be related to improved visual memory, complex attention, and reasoning ability.”

The study Snyder references followed 51 healthy young adults between the ages of 18 and 30. Subjects received 10 mg of FloraGLO lutein and 2 mg of zeaxanthin per day (n=37) or a matching placebo (n=14) for 12 months. The participants were assessed for serum lutein and zeaxanthin concentration, verbal memory, visual memory, reasoning ability, executive function, complex attention, and cognitive flexibility at baseline and after 12 months. After controlling for practice effects, the researchers found a statistically significant improvement in cognitive performance in the experimental group.

**Antioxidant Vitamins Go Clean-Label**

The clean-label trend has penetrated the antioxidants niche, particularly with respect to vitamins. Consumers—specifically Millennial consumers—are looking for more than just the lowest-price brand.

Saumil Maheshvari, marketing analyst for Orogenetics (Brea, CA), says that antioxidant vitamins are going up-market. “The antioxidant market may be following suit with the vitamin/mineral category, moving down the whole-food and USDA-organic route. The reason for that could be the increasing consumer awareness about clean labels and clean supply chains.”

“**One of the challenges of marketing antioxidants is that there are so many different types,**” says Saumil Maheshvari of Orogenetics.

Maheshvari says that consumers have started connecting the dots regarding antioxidant research and are looking for ways to supplement a diet that may not be very rich in antioxidants. As the antioxidant space continues to grow, Maheshvari expects consumer education to become a priority.

“One of the challenges of marketing antioxidants is that there are so many different types,” he says. “These antioxidants can have different effectiveness, and the use of ORAC values has been up for a bit of a debate. It depends on which antioxidant is prevalent in the product, as different antioxidants may have different properties.”

Orogenetics has followed the clean-label trend with its own products. Orogenetics’ branded Orgen line of vitamin-based antioxidant supplements has been standardized to ensure a consistent dosage, and the company uses water-based extraction to avoid contaminating ingredients with harmful solvents or excipients.

**Tocotrienol for Bone Health**

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As an antioxidant, lutein, derived from marigold flowers, is multifunctional.

occupy is bone health, which is what makes data on antioxidant ingredients like resvera-
trol so exciting. New research is also showing that certain vitamin E antioxidants can help promote bone health in a variety of ways.

Anne Trias, product director for American River Nutrition (Hadley, MA), says that while alpha-tocopherol vitamin E has long been prominent in the antioxidant space, the other family of vitamin E ingredients, tocotrien-
ols, are now showing even more promise for a variety of applications. Delta-tocotrienol, in particular, Trias says, appears to be the most bioactive of the vitamin E group.

Says Trias: “Antioxidant studies have found that tocotrienols are much more po-
tent antioxidants, by about a factor of 50, than alpha-tocopherol. Of the tocotrienol isomers, delta-tocotrienol is the most ac-
tive due to its preferable molecular makeup. Delta-tocotrienol isn’t a common vitamin in the Western diet, but a high concentration of it can be found in annatto, a plant whose extracts are used for food coloring.”

American River’s branded DeltaGold tocotrienol ingredient has been shown in studies to be particularly effective as a bone health supplement. One randomized dou-
ble-blind placebo-controlled clinical trial8 followed 87 postmenopausal women (aver-
age age 60) with lower-than-average bone density for 12 weeks. Participants were ran-
domly assigned to receive either 860 mg (n= 30) or 430 mg (n= 29) of DeltaGold brand tocotrienol per day, or a 430 mg placebo made from olive oil (n= 28), for 12 weeks. Study authors measured participants’ bone mineral density, vitamin D concentrations, and thyroid-stimulating hormone concent-
trations at baseline, week 6, and week 12. The study found that tocotrienol supple-
mentation decreased bone resorption and improved bone turnover rate. The authors hypothesize that tocotrienol’s osteoprotec-
tive effects may be a result of its antioxid-
ant properties.

Trias says that antioxidants have become synonymous with antiaging given that many aging processes are linked to oxidative stress. Older consumers, she says, are a strong market for antioxidants: “A 2018 consum-
er survey commissioned by the Council for Responsible Nutrition showed that 78% of adults over age 55 take dietary supplements, and the main reasons for supplementation included bone health, heart health, and healthy aging. Antioxidants play a role in all three of these categories, and older adults are likely to turn to formulations addressing these concerns first.”

POLYPHENOLS BOOST ANTIOXIDANT RESERVES IN HEALTHY ADULTS

Polyphenols have long been known to have in vitro antioxidant capabilities, but their efficacy in vivo was called into question 10 years ago, when certain research indicated the human body synthesizes enough polyphenols on its own to meet most people’s wellness needs. Now, though, new research has demonstrated that polyphenol supplementation does indeed boost plasma antioxidant levels in healthy adults. A randomized, placebo-controlled, double-blind crossover trial7, first reported in an October 2018 press release by Fytexia (Ven-
dres, France) on the company’s unique Oxxynea polyphenol ingredient blend, showed that polyphenol supplementation increased antioxidant defense and reserve capacity. This makes polyphenols a potentially important supplement for adults who may not eat enough fruits and vegetables in their diet.

Poor Consumer Diets Create Market Opportunities

Laure Nogier, marketing project manager for Fytexia, says that changing consumer lifestyle habits are opening up opportunities for supplement brands in the antioxidant space. Fruits and vegetables are the richest dietary source of antioxidants, Nogier says, particularly in the case of polyphenols. But with most consumers eating less than the World Health Organiza-
tion’s daily recommended intake of 400 grams of fruits and vegetables, most consumers aren’t getting enough polyphenols from diet alone to meet their antioxidant needs.

“Knowledge of phenolic compound metabolism and bioavailability has helped us develop an innovative formula for bioactive polyphenols within the main sub-families of phe-
nolic compounds,” Nogier says. “The concept of [supplement-to-whole-food] equivalence is a friendly concept for consumers that helps them meet their dietary needs, which is why Oxxynea 5-a-day is recommended at a dosage of 450 mg per day to equal five servings of fruits and vegetables.”

Nogier says antioxidants are gaining popularity for a number of reasons. Consumers are looking for health maintenance products that can fend off free radicals accumulated by any number of daily lifestyle factors, such as pollution, UV exposure, or lack of physical activi-
ty. Nogier notes that word antioxidant is well understood by consumers, and a number of brands are now narrowing focus on particular kinds of antioxidants like polyphenols, which appeal to an audience looking for plant-based solutions.
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Antioxidants in 2019

Expect the industry trends that have influenced other popular ingredient markets to continue changing the antioxidants market as well. Tetzlaf says consumers are looking for two things from antioxidant brands: Honest marketing and an easy-to-use format. Consumer demand for transparency will mean clean-label brands will perform best, while busy lifestyles will open up opportunities for convenient product formats like powders, gels, and stick packs. Antioxidants play many roles in human health, but consumers are looking for solutions to specific problems, which means product positioning and specificity matter.

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STUDYING ANTIOXIDANTS WITH PHYSICS

The worlds of nutrition and physics are about to collide as researchers examine antioxidants from both angles. Recently, Osaka University professor Kazuo Kobayashi (Osaka, Japan) conducted a series of experiments that involved using a linear electron accelerator, or LINAC, to shoot electrons at water molecules, causing the molecules to produce free radicals. Kobayashi said in a press release that his experiment has proven that LINACs are a valuable tool for biological research, and this opens up new avenues of study for biologists and other professionals who research antioxidants for a living.

Mike Straus is a freelance journalist living in Kelowna, Canada. He has written for publications including Canadian Chiropractor Magazine, UX Booth, and Iconic Concierge Vancouver.
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Traditional energy drinks like Monster, Rockstar, and Red Bull have long dominated the energy products space. These first-generation energy products, the darlings of adrenaline junkies everywhere, gained notoriety through smart marketing partnerships with major athletic events and by appealing to a youthful demographic with hip and cool marketing campaigns.

But energy products are no longer just for twenty-something college students. Penny Portner, director of marketing for Bioenergy Life Science (Andover, MN), says that energy products have grown up and are expanding in ways that allow these products to offer more than just a caffeine boost.

“A lot of brands are creating cross-functional products, while others are adding natural ingredients or reducing sugar and caffeine,” Portner says. “Too much sugar and too much caffeine were obvious health concerns [with traditional energy products]. These newer products are either going caffeine-free or are using alternative, natural sources of caffeine like ribose and green tea.”

Portner points to Bioenergy Life Science’s branded ribose supplement as evidence of this trend. Rather than hitting the consumer with a megadose of caffeine, Bioenergy Ribose provides consumers with exogenous ribose, the building block of ATP.

As consumers seek healthier energy alternatives, expect the energy products category to present opportunities for market growth and product innovation. Here are just some of the trends driving the energy market.

**Functional Concerns Drive Growth**

The energy products industry is no longer just about energy. Julie Deustua, PR and events manager for Compound Solutions (Carlsbad, CA), says that energy products are now turning toward additional functional concerns instead of merely adding more and more caffeine.

“The trend is toward a maximum of about 200 to 300 mg of caffeine,” Deustua says. “Products are layering mood and focus on top of energy. There’s also organic caffeine and adaptogens like cordyceps and ashwagandha for the natural crowd.”
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Deustua says that Compound Solutions’ branded energy products TeaCrine and Dynamine are quite popular among biohackers and gamers, two consumer groups who are looking for a long-lasting energy boost. Functional energy, she says, is the cool new kid on the block.

Says Deustua: “After 20 years of Monster and Red Bull, the market has finally innovated beyond just ‘energy’. Mood, motivation, and focus is the new white space.”

**Millennials Seek “Grown-Up” Energy Drinks**

Millennial consumers have long been the prime audience for traditional energy drink brands like Monster and Red Bull. A press release by Mintel noted that 61% of Millennials consumed energy drinks in 2015, up from 55% the year prior. Millennial consumers—and Millennial men in particular—have long been the face of energy drinks, and Mintel notes that two-thirds of older Millennial consumers believe that energy drinks and shots are good alternatives to coffee and sodas.1 Mintel is forecasting that the United States energy drinks/shots market will reach $19.2 billion in sales by 2021, a 47% increase over 2016.2

Brian Zapp, creative director for Applied Food Sciences (Austin, TX), says that 18- to 35-year-old males are a key demographic for energy product brands. Millennial consumers, he says, are also the same consumer base that is driving industry-wide changes.

“It’s important to observe that as this core consumer base matures, they will need ‘grown-up’ energy products that also fit with their values,” Zapp says.

**Clean-Label Products Gain Popularity**

Energy products and ingredients are undergoing an evolution. Zapp says that a large subset of energy product consumers don’t trust the artificial ingredients in mainstream energy drinks. By substituting artificial and unrecognizable ingredients with known ingredients like coffee and tea, he says, energy brands can leverage consumer familiarity to build trust.

“The image of energy is quickly changing into what is being identified as ‘clean energy,’ and even the largest companies are trying to evolve to stay on top of this trend. AFS has a core set of ingredients within the clean-energy category...over the last three years, AFS has been studying *Ilex paraguariensis* in depth to research its nootropic functionalities.”

*Ilex paraguariensis* is a sweet-tasting caffeinat-ed leaf of the holly species that grows in the upper Amazon basin in Colombia, Ecuador, and Peru and is related to yerba mate (*Ilex paraguariensis*). Zapp says that guayusa is just one of many clean-label ingredients that make up what Applied Food Sciences calls “the next generation of caffeine.”

“The largest area of use for guayusa is in beverages.” Zapp explains. “Our branded Amatea organic guayusa extract targets the modern workforce and even gamers—consumers who need a premium energy experience that boosts cognition.”

**Balanced Blends without Caffeine Jitters**

One emerging trend in the energy supplements space is the trend toward jitter-free products. Zapp says that Applied Food Sciences is pursuing research into the nootropic aspects of various botanical ingredients in order to provide the consumer market with better alternatives to caffeine. Caffeinated products, he says, come with a price: The jitters.

“When caffeine is metabolized, the adre-nal medulla releases the fight-or-flight hor-mone epinephrine,” Zapp says. “So the side effects of caffeine resemble the same feelings of nervousness or anxiety that are triggered when the body is under stress. We all know what that feels like, [that feeling] after you’ve had one too many cups of coffee.”

Zapp says that guayusa leaf extract presents a unique new opportunity in energy supplements: A boost without the jitters. He
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cites the results of a double-blind crossover clinical trial published in 2016 that examined the effects of guayusa leaf extract. In this trial, 12 healthy men between the ages of 21 and 34 were randomly assigned in a block-6 design to receive 200 mg of caffeine sourced from green coffee extract (n=4), the same amount of caffeine sourced from guayusa leaf extract (n=4), or a synthetic control (n=4). Three visits were scheduled at least 48 hours apart, and the participants crossed over to a different condition after each visit. The participants were assessed for serum caffeine levels, blood pressure, heart rate, and urinary levels of serotonin, GABA (gamma-aminobutyric acid), dopamine, epinephrine, norepinephrine, and glutamate.

This trial, which was funded by Applied Food Sciences, found that caffeine sourced from guayusa leaf extract did not cause any statistically significant changes in serotonin, dopamine, norepinephrine, or GABA levels. The study authors concluded that caffeine sourced from guayusa leaf extract may have fewer or less intense adrenaline-related side effects when compared to synthetic caffeine and caffeine sourced from green coffee extract.

**Emerging Opportunities for Savvy Brands**

Bioenergy Life Science’s Portner says that energy product brands would do well to simplify their marketing efforts. Nutritional factsheets are confusing, she says, and it’s not always easy for consumers to understand what they’re getting.

“There are just too many options out there,” Portner says, “and many of those options are too similar. So consumers either choose the brand they know, or they spend time reading nutritional facts until they find what they want. Brands need to simplify their formulations to be clean and unique.”

Deustua says that the energy market is increasingly moving online and direct-to-consumer, particularly where powders are concerned. Distribution and cooler space issues are making ecommerce solutions like Amazon more attractive options for energy brands given the lower overheads associated with online sales.

Consumers’ lives are getting busier and more complicated by the day. Long work hours, active family lives, and all manner of personal obligations encroach on their time and energy. As mainstream consumers turn to supplements and nutritional products to enable them to keep up with the busy pace of modern life, they will undoubtedly turn to healthier options that don’t leave them feeling jittery and nervous. Expect cross-functionalitv and different consumer subsets to open up a variety of verticals in the energy space in the future.

**Energy Products Get Smart and Go Online**

Energy product brands have started branching out into the cognitive performance market to appeal to biohackers, gamers, and busy working professionals. Deustua says that brands are now adopting ingredient blends that boost cognition by working directly in the brain as well as by leveraging the gut-brain connection.

“[Brain-oriented energy products are] using ingredients that hit the [central nervous system], but also stimulate a cognitive symphony of serotonin, dopamine, and acetylcholine,” Deustua says. “A separate segment that has been taking off is the low-carb energy segment—particularly, beta-hydroxybutyrate. This segment has seen exponential growth, and formulators are repurposing existing ingredients into nootropics products.”

Mike Straus is a freelance writer living in Kelowna, Canada. He has written for publications including Canadian Chiropractor Magazine, UX Booth, and Iconic Concierge Vancouver.

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As we all may (or may not) remember from our high-school biology classes, mitochondria are organelles frequently referred to as “the powerhouses of the cells” of living things. Mitochondria are responsible for respiration and energy production within the cells’ cytoplasm; the energy produced is in the form of adenosine triphosphate, or ATP. Mitochondria also generate heat, mediate cell growth and death, and store calcium for cell-signaling activities. The number of mitochondria per cell varies; for example, in humans, red blood cells contain no mitochondria, but liver cells and muscle cells may contain hundreds to thousands.

Reduced Mitochondrial Function
As we age, says David Tetzlaf, senior marketing manager for ingredient supplier Evolva (Reinach, Switzerland), which markets resveratrol for mitochondrial support, “the number and functionality of mitochondria naturally degrade, which may lead to cognition decline and also reduce our overall performance capacity.” He explains that muscles, for instance, will not perform without ATP; therefore, regenerating the mitochondria in muscle cells “is extremely helpful, especially as we age.” Resveratrol can be a tool to support this regeneration, he says.

Scott Steinfeld, of Trust Transparency Center consulting firm, likens mitochondrial support to properly maintaining our motor vehicles, and explains it this way: “Imagine your new car with a full tank of gas and the engine running. The engine maintains a steady purr as the combustion in the engine runs all cylinders, and all functions of the car are normal.

“Now imagine, as the gas is depleted, it is replaced with diluted gas, which causes the engine to slowly become less able to create the combustion necessary to make the engine run...
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smoothly. The heat produced as the spark-plug ignites the fuel becomes less and less. Horsepower is diminished, the ability to recharge the battery is diminished, and eventually the engine cannot keep up with the energy requirements of the vehicle.

“The car’s engine and functions slow to dangerously low levels, affecting all aspects of the vehicle’s performance. If the process of fuel dilution continues long enough, irreparable damage to the vehicle occurs.”

As it relates to the body, Steinford says, the diluted gasoline is comparable to mitochondrial dysfunction and its effect on the body’s “engine.”

Ingredients for Support
Thomas Bowman, PhD, senior scientist at Jarrow Formulas Inc., says that his company markets “several products in the category of mitochondrial support, including, principally, QH, which is reduced CoQ10, and PQQ.” He says the category can also include energy substrate, such as medium-chain triglyceride (MCT) oil; vitamin cofactors for mitochondrial energy (B vitamins); and energy-balance products for brain and neuron health. However, he adds, “CoQ10 is always an important place to start.”

CoQ10
“CoQ10 is one of the most important nutrients known for mitochondrial function in aging individuals,” Bowman says. The substance is a critical electron carrier necessary for aerobic metabolism, he adds, “as it oscillates between its oxidized form, ubiquinone, and reduced form, ubiquinol. This mitochondrial metabolism provides the efficient breakdown of fat and carbohydrate into working energy, in the form of ATP, for cells.”

Bowman contends that those with illnesses or who are taking prescribed drugs, including cholesterol-lowering statins, can especially benefit from CoQ10 supplementation. Additionally, he says, as people age, their CoQ10 decreases, resulting in reduced energy available for the body, including in the muscles, heart, and brain. Bowman adds that Jarrow’s QH-absorb product is clinically shown in humans to enhance CoQ10 levels by 215% at 100 mg per day, and 777% at 300 mg per day over baseline levels.

PQQ
Pyrroloquinoline quinone (PQQ) is “an extremely important cofactor in human metabolism,” says Jarrow’s Bowman. Studied extensively for the past 40 years, PQQ at one time gained significant support for being considered a vitamin, and, says Bowman, “recent research should again pique interest in PQQ. Earlier research showed that cultures containing PQQ demonstrated improved generation of mitochondria (mitochondrial biogenesis). Some PQQ researchers suggested that this might be due to the antioxidant activity of PQQ. However, newer studies have brought to light a more important mechanism of mitochondrial biogenesis by PQQ.”

A recent study published in Scientific Reports in 2016 by Akagawa and colleagues identified lactate dehydrogenase-A (LDH-A) as a PQQ-binding protein. Bowman describes. LDH is important for energy metabolism because it “regulates the substrates (pyruvate and lactate) at the beginning of the fork to aerobic versus anaerobic metabolism.” Akagawa et al demonstrated that PQQ increased concentrations of pyruvate through LDH activity, which resulted in enhanced mitochondrial biogenesis and basal respiratory rate. Additionally, LDH is a reliable biomarker of athletic endurance and recovery, Bowman says, since LDH increases in response to endurance training.

This research, then, “places PQQ as a vital supplement for mitochondrial health.”

Bowman also points to a clinical trial on supplementation with PQQ in 2016 that evaluated brain functions in aged persons. This study found that subjects supplemented with PQQ preserved better cognitive functions, particularly in attention and working memory. This clinical research supports the idea that PQQ and mitochondrial function and adaptation are necessary for healthy neurons in the brain, and further substantiates the role of PQQ in cognitive function, he says.

Additional Ingredients for Mitochondrial Support
Evolva’s Tetzlaf points to resveratrol supplementation as one of many valuable tools for mitochondrial support. “Resveratrol activates sirtuin 1 [SIRT1],” he explains, “which is involved in modulating beneficial effects on cellular processes, such as mitochondrial biogenesis.”

Indeed, a study published in 2011 in Pharmacological Reviews states that “the wealth of new data on SIRT1...has recently spontaneously refocused the attention of the field from a potential—but so far not clearly proven—role in increasing lifespan toward its ability to modulate whole body metabolism...SIRT1 activation enhances the ability of organisms to enhance fat
consumption and use mitochondrial respiration as a way to optimize energy harvesting. Metabolic disease has been strongly linked to impaired energy homeostasis and mitochondrial function. Therefore, manipulations aimed to enhance SIRT1 activity might turn out to be attractive for the prevention and treatment of metabolic disease."

Jarrow’s Bowman says, "There are actually too many mitochondrial supplements to describe fully in one article," but adds that a few deserve "special mention," including B vitamins, L-carnitine, alpha-lipoic acid, and taurine.

"B vitamins are involved in releasing the energy derived from foods by directing that energy into mitochondrial metabolism," Bowman says, while L-carnitine functions as a fatty-acid transporter of fat into mitochondria. Alpha-lipoic acid is an antioxidant, sulfur-containing thiol cofactor that helps to repair and maintain the blood-brain barrier. The substance is utilized in mitochondria via redox reactions at the initial conversion of pyruvate into acetyl CoA [coenzyme A] before entry into the Krebs cycle. "The Krebs cycle, as a reminder, is a sequence of reactions by which most living cells generate energy during the process of aerobic respiration. It takes place in the mitochondria."

And finally, taurine is a beta-amino acid found throughout the human body, but especially in highly metabolically active organs, including the brain and heart. "Of the cell's ions," Bowman says, "taurine is especially useful in regulating intracellular calcium concentrations. It also regulates sulfur metabolism and is a bile salt conjugate." Bowman classifies taurine as a mitochondrial-support ingredient. He warns, however, that the taurine added to some commercially available energy drinks is also frequently accompanied by large amounts of sugar.

Maureen Kingsley is a freelance writer, editor, and proofreader based in Los Angeles. She covers a variety of industries, including medical technology, food-ingredient manufacturing, and cinematography.

References
In the annals of “now-it’s-good-for-you/now-it’s-not” nutrition, few substances claim more hallowed ground than caffeine: demonized as a dangerous stimulant by some; prized as an indispensable performance enhancer by others. So which side is right?

The answer, perhaps, is neither. Or maybe both? It’s hard to say, because the ubiquitous bitter alkaloid has well-established benefits, and equally recognized risks, depending on who’s using it, at what levels, and in combination with what other substances.

Notes Michael A. Grandner, PhD, MTR, CBSM, assistant professor of psychiatry, psychology, and medicine, and director, sleep & health research program, University of Arizona College of Medicine (Tucson, AZ), “Caffeine has been used by humans for thousands of years.” And despite the ongoing debate over its merits-versus-drawbacks, “It’s probably becoming somewhat more ubiquitous.”

Which is all the more reason for our industry better to understand how and where caffeine helps, whom it might hurt—and what we just don’t know yet.

Drug of Choice
Leah M. Panek-Shirley, PhD, assistant professor, department of health, nutrition, and dietetics, SUNY Buffalo State (Buffalo, NY), is well aware of caffeine’s prominent role in contemporary life. She notes, “It’s one of the most widely used psychoactive drugs in the world.”

To hear such a common compound described as a “psychoactive drug” might, of course, sound dramatic. But a psychoactive drug is precisely what caffeine is—and so much more.

Notes Christine Fields, vice president, scientific affairs, Applied Food Sciences Inc. (Coralville, IA), “Caffeine is a stimulant. And no matter how you look at it, it has the ability to increase heart rate and blood flow, and to affect sleep.”

On the Plus Side
To some extent, such qualities help explain caffeine’s appeal. Who hasn’t turned to it—or the foods and beverages that are its source—for stimulation first thing in the morning or late at night?

And as far as many athletes are concerned, caffeine is the linchpin to their effective training. Fields notes that caffeine is the number-one ingredient in both pre-workout and endurance sports nutrition formulations, with many of the former delivering as much as 200 to 300 mg of caffeine per serving. “According to researchers!”, she says, “approximately three out of four elite athletes consume caffeine before or during sports competition.”

For its part, the United States Olympic Committee—which permits caffeine’s use—has concluded that by activating receptors in the brain and body that counteract many of fatigue’s inhibitory effects on performance, caffeine enhances endurance;
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Protecting the Vulnerable
If you’re especially sensitive to caffeine or susceptible to small changes in blood pressure, blood flow, and heart arrhythmias, quite possibly a lot.

“Caffeine is still considered a controversial substance,” says Panek-Shirley, “with the protection of vulnerable populations at the center of most controversy. Who are those vulnerable populations? There’s concern about the safety of fetal caffeine exposure from a pregnant woman’s intake.”

Panek-Shirley continues, “the possibility of adverse cardiovascular effects among children, and the risk associated with adolescents as well as young adults combining caffeine with alcohol.”

Indeed, when caffeine lands in the hot seat, it’s often because of harm it’s meted out on the young. Citing the findings of a 2017 study on the safety of ingested caffeine and its impact on sleep, including two recent studies outlining modelling tools developed to help predict typical metabolism and associated caffeine use on adenosine receptor activity.

Panek-Shirley hails the aforementioned 2017 safety study and a contemporaneous review exploring caffeine and coffee’s roles in appetite regulation as “invaluable reference resources, as they examine research from various databases and summarize meta-analysis results,” she says.

Another study from earlier this year attracted the attention of Carol DeNysschen, PhD, RD, MPH, assistant professor, department of health, nutrition, and dietetics, SUNY Buffalo State, and president, New York State Academy of Nutrition and Dietetics (NYSAND), for finding that accidental deaths from over-the-counter or dietary caffeine products represent the most common cause of caffeine-related death—a statistic that should concern our industry.

“The high frequency of use, uncontrolled sale of caffeine-containing products, and potentially triggering action of caffeine on the cardiovascular system pose serious risks to the health and safety of consumers,” she cautions.

That being the case, work at Northwestern University School of Medicine might someday suggest a means of mitigating that risk. And, as Fields points out, the research is shedding new light on how different genetics can, and do, influence individuals’ caffeine uptake, excretion, and use. “This is a start to understanding many of the metabolic pathways into CYP1A2-mediated metabolism and the associated inter-individual variants,” she says.

Sounds impressive. But for now, caffeine users can stay safe by practicing moderation and paying attention to the evidence they observe in their own bodies. As Fields says, “Consumers are now more fully aware of how caffeine affects them individually and are responding to their personalized needs with regulated intake based on lifestyle demands.”

Read on to learn more of the truths about caffeine, the myths, and the head-scratchers we’re still muddling through.

**Myth 1**

**Caffeine Jump-Starts Your Day**

Convinced you can’t get going without that first shot of caffeine—whether courtesy of an espresso, Americano, or plain-old cuppa Joe? Prepare to have your mind—and morning ritual—blown.

“The truth is, caffeine won’t have much of an effect first thing in the morning due to how it works in the brain,” Grandner says. Any effect, he maintains, is likely either 1) a placebo, 2) the result of removing the caffeine withdrawal you’d been experiencing since your last infusion, and/or 3) “the natural reduction in sleep inertia that would have happened in the first hour after waking anyway.”

Caffeine’s effectiveness depends a lot on timing, and it takes about 20 minutes to produce those perceived increases in alertness and performance, Grandner says. “So if you start getting your first burst of energy with that immediate first sip,” he says, “that’s a placebo response.”

**Myth 2**

**Caffeine Has a Neutral Influence on Sleep Quality**

The notion that caffeine keeps us awake all night is empirically false—as anyone who drifts off despite that after-dinner cappuccino can attest. But even if you do slip to dreamland post-shot, your dreams might not be as deep, nor as sweet, as you’d hope.

That’s because, as Grandner points out, “While caffeine in the afternoon or evening...
can make it harder for some people to wind down while others fall asleep just fine, often their sleep is shallower, especially in the beginning of the night.”

The reason: Everybody metabolizes caffeine differently. Perhaps even more importantly, Grandner says, “Just because you fall asleep doesn’t mean you aren’t experiencing caffeine’s effects.” Which leads to the next caffeine myth...

Myth 3
Caffeine in the Morning Can Make Up for a Poor Night’s Sleep

“Caffeine can’t replace lost sleep,” Grandner declares. “There have been excellent studies showing that although caffeine can improve alertness and reduce fatigue, it doesn’t correct the cognitive impairments associated with sleep loss.”

In other words, while caffeine make you faster and more alert, “it doesn’t improve thinking ability or decision making,” Grandner continues. Which is why he considers it solely a short-term solution for boosting alertness and taking the edge off that drowsy or lethargic feeling that follows a restless night. In the end, he says, “There’s no replacement for sleep.”

Myth 4
Caffeine Is Coffee, and Coffee Caffeine

Given that coffee remains the prototypical caffeine-containing beverage, it makes sense to associate its benefits with caffeine. What’s more, it’s tempting to disregard the latter’s
risks when imbibing the former’s purported benefits.

So what’s the bottom line? “The prevailing thought seems to be that moderate coffee consumption can be beneficial to health,” Dando says, “I should specify that this is coffee—not caffeine—and that coffee contains a whole lot of other compounds in addition to caffeine.”

Panek-Shirley agrees. She points to epidemiological studies showing correlations between coffee consumption and decreased health risks. “But there are other constituents in coffee beyond caffeine that could contribute to this benefit,” she emphasizes.

Investigation into what those constituents might be and how they work continues, and in the interim, the latest Dietary Guidelines for Americans hold that moderate coffee consumption can be healthy. “Despite this,” Dando advises, “coffee should be avoided in pregnancy and when breastfeeding, and it may be wisely avoided by those with high blood pressure.”

**Myth 5**

**Caffeine Is the Ergogenic Secret to Sports Success**

“Because my current caffeine projects investigate the short-term independent and combined effects of caffeine and exercise on eating behavior, as well as relationships between caffeine intake and wellbeing in a high-stress, high-turnover profession, I follow studies related to those topics,” says Panek-Shirley. “And two myths I’m most concerned about relate to caffeine’s ergogenic and appetite-suppressing effects. These myths are based on truths, but there are limitations to the expected benefits.”

Let’s explore the ergogenic story first: “Some athletes and exercisers believe caffeine as a pre-workout supplement will help them exercise longer and harder with less fatigue,” she observes. And they have a point: Caffeine does improve performance and decrease perceptions of fatigue.

But to reap its gains, athletes need to have withdrawn from their usual caffeine intake—or to have consumed larger doses. And even then, the benefits are limited. “Unfortunately,” DeNysschen adds, “high caffeine doses induce negative side effects, like diuresis, anxiety, and increased heart rate, which would detract from the benefit of caffeine and exercise.”

**Myth 6**

**The Caffeine Diet Is a Silver Bullet to Weight Loss**

“Regarding caffeine’s effect on weight loss,” Panek-Shirley continues, “individuals looking for quick and simple solutions may use caffeine-containing products to boost energy...”
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Can caffeine consumption boost metabolism and decrease appetite?

metabolism and decrease appetite. And caffeine is a sympathomimetic, so it does modestly increase metabolism. Higher doses have also been shown to reduce both appetite and energy intake.

But the higher caffeine levels needed to maintain that boost and keep appetite and food intake at bay may be neither safe nor durable. “My own research10 has identified that at typical doses, caffeine’s effect on appetite and intake is limited and transient,” she says.

Besides, adds Dando, “The slight bump in metabolic rate you may experience is likely offset by the cream and sugar in your coffee—and definitely by the cinnamon roll you eat with it. This all points back to the same boring food-and-drink advice you’ve gotten since you were a kid: Moderation is key.”

Myth 7
You Can Safely Mix Alcohol and Caffeine If You’re Not Sensitive to Caffeine

We know the body rapidly absorbs up to 90% of the caffeine it consumes through the stomach, with plasma concentrations peaking within 20 to 40 minutes of intake, Fields says. The upshot: “Toxic levels can be reached quickly and last for prolonged periods, given caffeine’s three- to 10-hour half-life, depending on the individual.”

And because the liver metabolizes caffeine via N-demethylation, acetylation, and oxidation—the same pathways used to remove alcohol and other medications from the system—the dual ingestion of both caffeine and alcohol can prolong the former’s half-life by as much as 70%, she continues, “creating an acute or prolonged toxic effect after ingestion.” Just say no?

Myth 8
We Don’t Know What Constitutes a Safe Level

The International Life Sciences Institute (ILSI), a global nonprofit commissioned to provide science on caffeine’s health and safety, commissioned a 2016-2017 caffeine safety assessment11 whose results confirmed that previously determined caffeine doses of 400 mg/day for healthy adults, 300 mg/day for pregnant women, and 2.5 mg/kg body weight/day for adolescents and children—as also determined by Health Canada and the EU—“remain appropriate not to be associated with adverse effects,” says Fields, herself an ILSI member.

The assessment comprised “a robust and extensive review” for five outcome areas in healthy adults, pregnant women, adolescents, and children with historic negative caffeine associations—namely, acute toxicity, cardiovascular toxicity, bone and
calcium effects, behavior effects, and development and reproduction effects.

ILSI used a weight-of-evidence approach to draw conclusions for each of the five outcomes and to generate more specific endpoints within those outcomes, Fields adds, giving the study a "tremendous impact" and producing "a shift for caffeine research from healthy to sensitive populations."

Nevertheless, says DeNysschen, "Because caffeine content isn't required on any food or supplement labels and its benefits come with risks, we should be wary of using supplemented products. We should be increasingly cautious of the marketing of 'energy' products to adults and youth."

Kimberly J. Decker writes for the food and nutrition industries from her base in the San Francisco area, where she enjoys eating food as much as she does writing about it.

References
The next time you see young parents pushing a baby carriage down the street, you may want to check before congratulating them on the birth of their new child—it could very well be a dog. Today’s 20- and 30-somethings are spending and doting on their “fur babies” like new moms and dads, and even considering them as practice for the real thing. They dress them in clothes, bring them everywhere, and, yes, seek out the highest-quality foods and wellness products for them. And this is great news for pet nutraceutical ingredient suppliers and brands.

“The state of the pet health market as a whole is on the rise because of the overwhelming growth in the number of Millennial pet owners” who are willing to loosen their purse strings for high-quality food and nutritional supplements, says Jon Getzinger, chief marketing officer at Puris (Minneapolis, MN). In fact, according to Nielsen Product Insider, demand for high-quality premium pet food has boosted sales dramatically, with annual pet food household spending increasing 36% between 2007 and 2017.1 Looking ahead, the global pet supplement market is expected to expand at a CAGR of about 5% between 2018 and 2026, says Research and Markets.2

“I’ve been in this industry since 1999, and I would say that the industry is stronger now, and the growth more dynamic and robust, than I’ve ever seen it,” says National Animal Supplement Council president Bill Bookout. “The changes in society being more conscience of what we eat, like GMOs, as well as a focus on the importance of nutrition, exercise, and health in general—all of this is fueling growth in the human area and then in the pet area.”

Bookout says that tried-and-true ingredients in the pet space, like chondroitin and glucosamine, remain popular. In fact, he adds, 20% of the ingredients on the market make up 80% of the demand for products. So there are still some big players that are and always have been on pet owners’ radars.

That said, trends in the human supplement market are trickling into the pet supplement arena, opening the door for new and interesting ingredients and research.

More and more shoppers want their pets to have the same high-quality, cutting-edge ingredients found in human supplements.
Digestion Demands

According to Packaged Facts’ most recent “Pet Supplements in the U.S. report,” digestive-health supplements have joined joint-health supplements as the most commonly purchased condition-specific supplement types among dog owners, with 13% of buyers purchasing them. Digestive-health supplements actually surpassed their joint-health counterparts among cat owners, with 7% and 5% purchasing these types, respectively.

“Digestive support is a priority for pets, as it is not uncommon for dogs or cats to experience episodes of spontaneous vomiting, regurgitation, flatulence, and diarrhea,” says Sam Michini, vice president of marketing and strategy at Deerland Probiotics and Enzymes (Kennesaw, GA). “In both dogs and cats, many studies have shown that a healthy population of gut bacteria is vital to a well-functioning gastrointestinal tract.” And, as pet owners understand the importance of a healthy microbiome for themselves, they are looking to support the same in their pets. According to Michini, strains known to benefit dogs include *Bacillus coagulans* and *Lactobacillus acidophilus,* “which has been shown to improve frequency and quality of stools in dogs with sensitive digestive systems,” he adds.

Digestive and joint health are the most common supplements for dogs, says Packaged Facts.

Enzyme ingredients represent yet another digestive-health category heavily in demand for pets. Michini says popular enzymes for pets include protein-digesting protease, bromelain, and papain; fat-digesting lipase; carb-digesting xylanase, cellulase, beta-glucanase, amylase, and glucoamylase; and pancreatin (a combination ingredient).

Joint Health Opens the Door

Joint health has always been a popular category for pet supplements. “Since joint pain is one of the most prevalent issues for pets, joint-health products are commonly sought after by pet owners,” says Andrew Rice, director of product and brand strategy at Stratum Nutrition (Carthage, MO). The downside? “Many joint-health ingredients that have been on the market for some time take several weeks to work—if they work at all—which is displeasing for pet owners.” That’s why his company’s NEM brand egg-shell membrane is piquing the interest of pet supplement brands and shoppers alike. According to Rice, NEM’s results can be seen in just one week.

Collagen is yet another joint-health ingredient that’s incredibly popular in the human supplement market and making its way to the pet aisle. “Lonza’s UC-II undenatured
type II collagen, which forms part of the increasingly popular super-premium pet food category, helps to enable mobility, flexibility, and healthy joints,” says Kevin Owen, global business development, companion animals, for Lonza Consumer Health and Nutrition (Morristown, NJ).

It’s no surprise, also, that pet owners are also seeking out weight-control ingredients. No, Millennial pet parents haven’t completely gone off the deep end—healthy weight often means less stress on joints. And, for that, Lonza offers its weight-management ingredient Carniking L-carnitine.

“L-carnitine helps the animal’s body to metabolize and convert dietary fat into energy, enabling more effective fat utilization,” Owen explains. “Lonza’s Carniking L-carnitine ingredient, for instance, has been shown to help maintain lean muscle mass in active dogs, while also aiding recovery after exercise.” Last year, the ingredient was granted a U.S. patent for use in pet food at a dose of 250 mg/day.

The ingredient has also been shown to help with energy, another category seeing growth in the human and pet supplement aisle. In four canine research studies, Lonza says, Carniking was shown to improve exercise performance, activity, lean muscle mass, muscle recovery, and oxidative stress during strenuous exercise.

But no discussion of performance—pet or otherwise—is complete without touching on protein. Getzinger says that pet brands are moving towards more high-protein products, and away from grains, just like in the human market. “Pulse proteins and pulse starches and fibers have been a strong portion of pet diets over the last decade,” he says, “but consumers are always looking for the next best thing.” For Getzinger, this means a shift towards sustainable, regenerative, and ethically sourced ingredients (yet another trend that’s trickling in from the human side), such as those from the pea. “Puris pea starch is one of the newest products being offered, alongside our protein line,” he adds. “Peas are unique because they have the ability to not only provide nutritious food for people and pets, but they provide nutrients to the soil” as they pull nitrogen out of the air and pack it back into the earth—which leaves the terrain healthier than before they were planted.

### WHAT’S HAPPENING WITH CBD?

According to National Animal Supplement Council president Bill Bookout, hemp cannabidiol (CBD) represents the most innovative and exciting newcomer to the pet supplement market. Here, he tackles some of the most pressing questions facing the industry.

**Question**

Why is hemp oil in demand right now for pet owners?

A  Like many trends on the companion animal side, they tend to follow those established on the human side. People make the assumption, sometimes wrongly, that what is good for them may also be good for their dog, cat, or horse. This is not always the case, and an example would be the [cannabinoid] tetrahydrocannabinol (THC) toxicity in animals where the response or sensitivity levels would be different than people’s. That’s why I always recommend buying a product from a quality company experienced with these types of products specifically marketed for animals.

**Question**

What are some of the concerns with using CBD or hemp oil in pet supplements?

A  Very simply, I think the two greatest concerns right now are the regulatory uncertainty and opportunistic suppliers getting into the market who want to make a fast buck. As I have said about all supplements, there are two things that are always true. First, cheap products are generally cheap for a reason; quality costs money, and you usually get what you pay for. Second, companies that make claims that sound too good to be true probably are. If you see a company with a product claiming to help cancer, arthritis, Cushing’s syndrome, seizures, etc., or implying potential benefits for treating or preventing any disease, the company is irresponsible. Don’t buy their product. They are in violation of the law and should be a concern to all responsible members of the industry.

**Question**

Where should supplement brands and manufacturers look for the most updated information on this topic?

A  This particular topic is a very fluid and dynamic environment. Many people have opinions but the fact is no one really knows what the final pathways for marketing these products will look like until FDA gives us all more definitive guidance. [Recently resigned] FDA Commissioner Dr. Scott Gottlieb indicated this guidance may take two to three years to be developed, and Congress may further consider the issue as well. The legal blogs usually do a pretty good job of presenting the current facts; however, opinions here still vary. My best advice is to get information from multiple credible sources and not rely on any one particular opinion.

**Melissa Kvidahl is a freelance journalist and copywriter specializing in the health and wellness industry.**

**References**


Any Questions?

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Sweet News!

Consumers are demanding more from their chocolate and willing to pay up for quality.

BY SEBASTIAN KRAWIEC, ASSOCIATE EDITOR

Chocolate consumers are becoming more discerning. This, in turn, is steering the business of chocolate companies. A good example is the increase in dark chocolate SKUs from brands trying to meet consumer demand for refined flavors and more wholesome ingredient decks. “Total U.S. chocolate candy market sales have seen a slight compound annual growth rate over the past six years, which can be attributed to product premiumization,” explains Gretchen Hadden, marketing communications manager for Cargill Cocoa & Chocolate North America (Milwaukee, WI). “As many consumers are becoming increasingly health conscious, indulgent consumption has become more about quality over quantity, with consumers gravitating towards gourmet chocolate in order to really make the moment count. Dark chocolate, which often in the eyes of consumers holds some cachet amongst other chocolate varieties, is often at the center of the premium chocolate space.”

Among consumers, dark chocolate has a healthier halo because it often has less sugar compared to milk or white chocolate, and a higher cacao content which not only offers a unique flavor profile, but also perceived health benefits. Health food bloggers often tout dark chocolate’s rich antioxidant content, among other benefits. Additionally, a dark chocolate product allows for a smaller ingredient deck.

“You’re seeing higher levels of consumers looking for ‘free from’ products,” says Laura Bergan, director of marketing for Barry Callebaut (Zurich, Switzerland). “Consumers are more than ever looking at ingredient decks, the backs of labels, to determine what’s in their products, what kind of allergens are in there, and how clean the ingredient deck is.”

At the same time, says Bergan, consumers don’t want to sacrifice flavor. Chocolate is still a treat, an indulgence, and they’re willing to pay up for quality. “We’re starting to see a split within the market of premium vs. value, and a lot of food companies are choosing that premium route, looking for premium solutions and offering those to their consumers,” she explains.

As Hadden points out, for consumers these days, it’s more about quality than quantity. Suppliers are taking notice, too. Cargill, for example, recently closed on its acquisition of Smet, a Belgium-based supplier of chocolate and sweets decorations to the food service and confectionery markets. With the acquisition, Cargill hopes to provide product portfolio and services to artisans and chocolatiers, bakeries, hospitality businesses, and food service industries, as well as accelerate growth in the gourmet segment.

Barry Callebaut, for its part, has released a unique premium chocolate called Ruby Chocolate, which Bergan says meets multiple consumer need states no other chocolate has met before. “Ruby really hit the area of extreme indulgence. There’s not a chocolate that existed before it that really met the hunger for a multi-sensorial delight,” explains Bergan. The chocolate is the result of 10 years of research and development. It is sourced from a cocoa bean that delivers a fresh berry–fruitiness, smoothness in flavor that is not bitter nor too sweet, and a ruby color, without added flavors or color, which also meets demands for clean label. Because it’s a rather novel product, it’s still awaiting regulatory approval in the United States, but has launched globally in Shanghai, China, and was used in a Kit Kat SKU exclusive to Japan. In the U.S., Ruby Chocolate is being piloted by three premium brands—Chocolove, Harry & David, and Vosges—though they are yet unable to call it chocolate before approval from FDA.

“Eating chocolate has become more of an experience,” says Hadden. It’s clear that consumers will continue to chase unique experiences and challenge suppliers and manufacturers alike to continue innovating.
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